

The genus *Pseudolathra* Casey in China: new species and new records (Coleoptera, Staphylinidae, Paederinae)

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Abstract

Two new species of the genus *Pseudolathra* Casey from mainland China are described and attributed to their respective species groups, *P. cylindrata* **sp. n.** from Hubei and Sichuan, and *P. superficiaria* **sp. n.** from Yunnan. *Pseudolathra pulchella* (Kraatz, 1859), *P. transversiceps* Assing, 2013 and *P. bipectinata* Assing, 2013 from Yunnan are reported from China for the first time. The history of the exploration of the Chinese fauna of *Pseudolathra* is summarized.

Keywords

New species, *Pseudolathra*, Paederinae, Staphylinidae, China

Introduction

Except for the better known West Palearctic region (ten species), the taxonomy, diversity, and zoogeography of the paederine rove beetle genus *Pseudolathra* Casey, 1905 are currently somewhat unclear (Assing 2012). However, the recent revision by Assing (2012) and its supplement (Assing 2013) significantly improved the situation for the East Palearctic and Oriental regions, where the genus currently includes 19 species, some of which are distributed across both regions. Even though a thorough phylogenetic subgeneric division of *Pseudolathra* is still pending, Assing (2012) suggested that all East Palearctic and Oriental species represent a distinct lineage currently assigned to the subgenus *Allolathra* Coiffait, 1972 and subdivided into three species groups, *P. regularis*, *P. nigerrima* and *P. unicolor* groups.

With respect to China, a country of vast dimensions, rich biodiversity, and with a poorly studied rove beetle fauna, the discovery of numerous new species of *Pseudolathra* has been predicted (Assing 2012, 2013). Before our study, only three species were recorded from China: *P. unicolor* (Kraatz 1859) from Yunnan, Guangxi and Taiwan, *P. regularis* (Sharp 1889) from Sichuan, Shaanxi, Yunnan and Jiangsu, and *P. lineata* Herman 2003 from Jiangsu, Jiangxi and Taiwan (Assing 2012).

Based on recently collected material, two new species from mainland China are here described and illustrated: *P. cylindrata* sp. n. from Hubei and Sichuan, and *P. superficiaria* sp. n. from Yunnan. Three additional species, *P. bipectinata* Assing, 2013 (Yunnan), *P. transversiceps* Assing, 2013 (Hainan) and *P. pulchella* (Kraatz, 1859) (Hainan) are reported from China for the first time. Using the diagnostic characters provided by Assing (2012), *P. cylindrata* sp. n. is placed in the *P. unicolor* species group, and *P. superficiaria* sp. n. in the *P. nigerrima* species group, both in the subgenus *Allolathra*. Thus, altogether eight species of *Pseudolathra* are presently known from China.

The type specimens are deposited in the Institute of Zoology, Chinese Academy of Sciences (IZCAS) and some duplicate paratypes deposited in the collection of the Natural History Museum of Denmark (Zoological Museum of the University of Copenhagen, ZMUC).

Material and methods

Specimens were relaxed in warm water (60°C) for 10–12 hours for dissection of the last abdominal segments containing the aedeagus. The detached abdominal segments were placed into KOH (10%) for 10–24 hours (depending on the degree of sclerotization) to clean sternites VIII-IX and the aedeagus from the surrounding tissues. Then they were placed into 75 % alcohol for ca. 2 minutes and transferred to vials with glycerin for examination. After examination, the dissected parts were placed in plastic genitalia vials, which were pinned under the respective specimens. Observations, drawings and measurements were made under a compound microscope (Leica MZ–APO).

All measurements were taken with an eyepiece micrometer and are given in millimeters. Total body length was measured from anterior margin of labrum to apex of abdomen. Forebody length was measured from anterior margin of labrum to apex of elytra. All other measurements were taken and abbreviated as follows:

- HL** head length (from the anterior clypeal margin to the occipital constriction)
EyL eye length (in dorsal view)
AL antennal length (from the base of antennomere 1 to the apex of antennomere 11)
PL pronotum length (along midline)
EL from the apex of scutellum to the elytral posterior margin
PW pronotum width (maximal)
HW head width (including eyes)
EW maximal combined elytral width
ABW abdominal width (maximal)

Taxonomy

Pseudolathra cylindrata sp. n.

<http://zoobank.org/4E9E7410-468B-40BA-A130-32D979426B19>

http://species-id.net/wiki/Pseudolathra_cylindrata

Figure 1

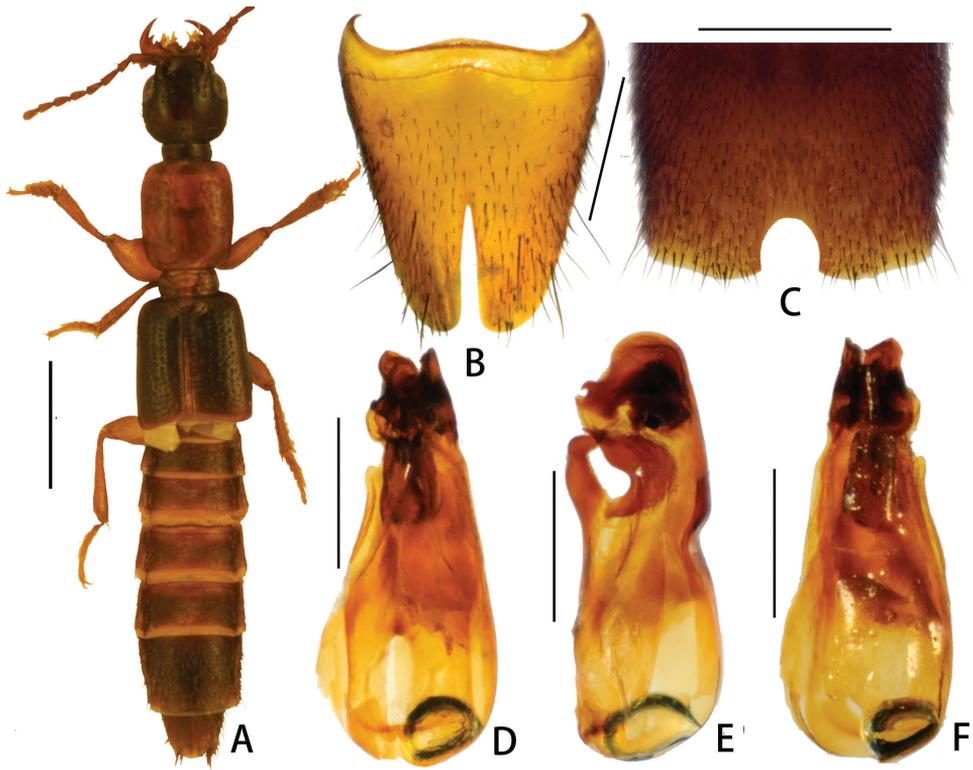
Type material. **Holotype**, ♂, **Hubei**, Zigui, Jiulingtou 110 m, 5.IX.1994, collected by Fasheng Li (IZCAS); **paratypes**, 1♀, same data as holotype (ZMUC); 1♀, **Sichuan**, Fengdu 200 m, 1.VI.1994, collected by Youwei Zhang (IZCAS).

Description. Length: 6.5–6.9 mm; length of forebody: 3.4–3.8 mm. Body glossy, vividly colored with head capsule black, pronotum and abdomen brown, elytra black with the apical margins more or less blackish-brown; antennae and mouthparts dark reddish, legs brownish red.

Head glossy, approximately as broad as long, vertex slightly convex. Punctures on head coarse and sparse, in median dorsal portion very sparse; interstices without microsculpture, but with micropunctuation. Eyes relatively small and slightly protruding laterally. HL/EyL = 2.8, eyes shorter than postocular region in dorsal view. Antennae slender, about 1.9–2.0 mm long; all antennomeres oblong.

Pronotum oblong, PL/PW = 1.2, widest at its anterior third and approximately 1.2 times as broad as head, lateral margins straight; on either side of the impunctate midline with series of 13–16 punctures, some of these punctures often accompanied by additional punctures; punctures of lateral portions sparse to moderately dense; interstices without microsculpture.

Elytra parallel-sided, EL/EW = 8.5, slightly longer than pronotum; punctures on surface arranged in 5 series in dorsal view; interstices without microsculpture. Hind wings fully developed.



Figures 1. *Pseudolathra cylindrata* sp. n. from Hubei and Sichuan. **A** habitus **B** sternite VIII, male **C** sternite VII, male **D** aedeagus, dorsal view **E** aedeagus, lateral view **F** aedeagus, ventral view. Scale bars: **A** = 1 mm; **B–F** = 0.5 mm.

Abdomen approximately as broad as elytra, wider than head or pronotum; punctuation very fine and dense; interstices with microsculpture; posterior margin of tergite VII with palisade fringe.

Aedeagus (Fig. 1D–F) about 1.25 mm long, length/width = 2.4. Dorsal plate fused with median lobe. Ventral process strongly sclerotized and curved (Fig. 1D, E). Internal sac with some strongly sclerotized structures.

Male sternite VII (Fig. 1C) with narrowly semicircular excision, margins of this excision slightly depressed; male sternite VIII (Fig. 1B) with posterior excision narrow and deep, not quite reaching middle of sternite.

Female sternites VII–VIII without any modifications.

Etymology. The species name is the Latin adjective meaning cylindrical. It refers to the shape of the aedeagus of this new species.

Remarks. Based on the relatively smaller body size, brownish coloration with darker head and elytra, as well as distinctly sclerotized aedeagus with an apically projecting dorsal plate, the new species belongs to the *P. unicolor* group *sensu* Assing (2012). Within this group, the new species is externally very similar to *P. pulchella* (Kraatz), but

differs as follows: 1) the posterior excision of the male sternite VIII in the new species (Fig. 1B) is narrower and deeper (*P. pulchella*: figure 39 in Assing 2012); 2) the aedeagus in *P. cylindrata* sp. n. is of a different shape, with its ventral process forming a distinct perforation in lateral view (Fig. 1D–F; *P. pulchella*: see figures 33–34 in Assing 2012).

Distribution. *Pseudolathra cylindrata* sp. n. is known only from the type locality: Jiulingtou in Zigui County, Hubei. The type series was collected in the period from June to September, the altitudes ranging from 100 to 200 m.

***Pseudolathra superficiaria* sp. n.**

<http://zoobank.org/32416B79-5297-4242-91CD-CE76BDCE00B2>

http://species-id.net/wiki/Pseudolathra_superficiaria

Figure 2

Type material. Holotype, ♂, Yunnan, Mengla County, Township Yaoqu, 1030 m (21.73°N, 101.52°E), 4.X.2010, leg. Xi Zhang (IZCAS).

Description. Length: 6.5 mm; length of forebody: 3.2 mm. Body black, glossy; abdomen with posterior and lateral margins slightly dark reddish; legs, antennae and mouthparts reddish.

Head (Fig. 2A) weakly transverse, approximately 1.1 times as wide as long; vertex slightly convex, posterior angles marked. Median area almost impunctate, lateral portions with coarse and very sparse punctures; punctures around eyes and along neck relatively fine and dense; interstices without microsculpture and micropunctuation. Eyes large and bulging, HL/EyL = 1.7, approximately 1.5 times as long as postocular region in dorsal view. Antennae slender, about 1.85 mm long; antennomeres III–X with very narrow bases and broadened apices.

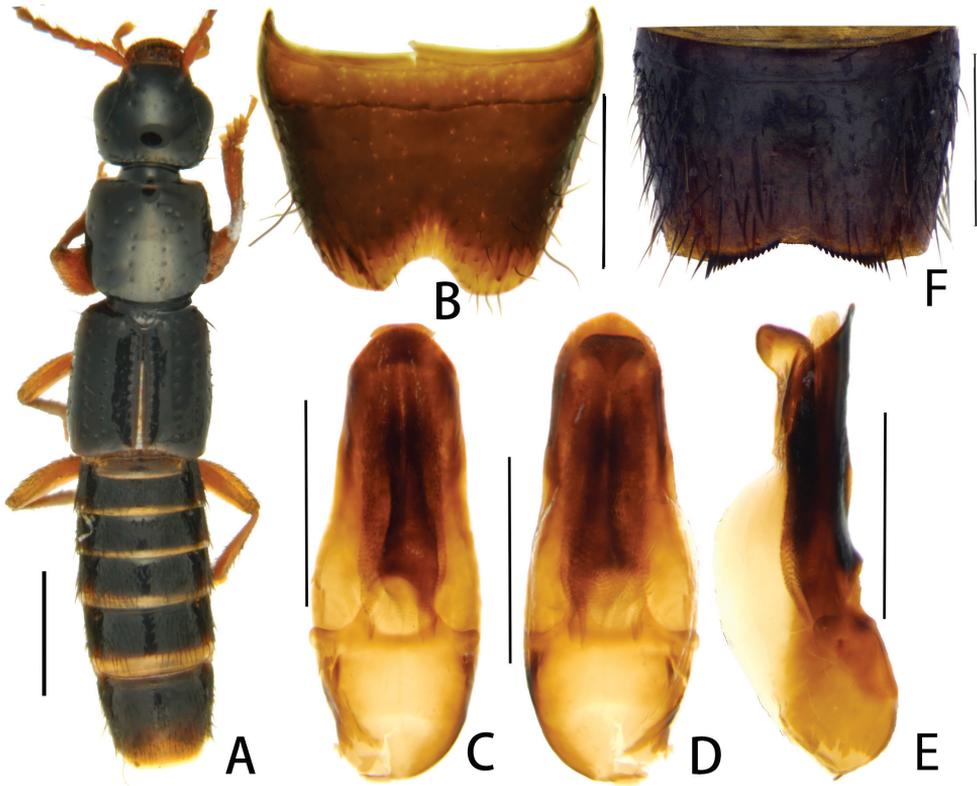
Pronotum (Fig. 2A) approximately as long as broad and as wide as head, anterior angles distinct and posterior angles round; on either side of the impunctate midline with series of 1+4 coarse punctures in dorsal view; lateral portions with very sparse and coarse punctures; some of those coarse punctures having additional smaller punctures.

Elytra with EL/EW = 8.7, slightly longer than pronotum, with fine epipleural ridge; punctures on dorsal surface arranged in 3 pronounced series on each elytron; interstices without microsculpture. Hind wings fully developed.

Abdomen approximately as broad as head or pronotum, but narrower than elytra; punctuation on tergites III–V very coarse and dense, tergites VI–VIII with punctures relatively fine and dense; interstices without microsculpture; posterior margin of tergite VII with palisade fringe.

Aedeagus about 1.1 mm long, length/width = 2.7, weakly sclerotized, shaped as in Fig. 2C–E.

Male sternite VII (Fig. 2F) with posterior margin weakly and broadly concave, on either side of the middle with comb of stout, black, spine-like setae increasing in length and thickness laterad, margins of the concavity slightly depressed and glabrous; male sternite VIII (Fig. 2B) with semicircular, broad and relatively shallow posterior excision.



Figures 2. *Pseudolathra superficialia* sp. n. from Yunnan. **A** habitus **B** sternite VIII, male **C** aedeagus, ventral view **D** aedeagus, lateral view **E** aedeagus, dorsal view **F** sternite VII, male. Scale bars: **A** = 1 mm; **B–F** = 0.5 mm.

Females unknown.

Etymology. The species name is the Latin adjective meaning superficial. It refers to the shallow posterior excision of the male sternite VIII of the new species.

Remarks. Based the synapomorphic modifications of the male sternite VII (posterior margin bipectinate and notched in the middle) and the similar morphology of the aedeagus, the new species is closely allied to *P. bipectinata*. For illustrations of *P. bipectinata* see figures 17–18, 22–23 in Assing (2013). Like *P. bipectinata*, *P. superficialia* belongs to the *P. nigerrima* group and can easily be distinguished from other species of this group by the broad and shallow (not deep and narrow) excision of the male sternite VIII, and by the characteristic structure of the aedeagus.

In fact, the shallow and broad excision of the male sternite VIII was previously reported as a unique character of the monotypical *P. regularis* group (Assing 2012), however, the exact shape of this shallow excision is different in both species. Besides, *P. superficialia* sp. n. differs from *P. regularis* by the more transverse head with larger eyes, the much more transverse pronotum, and the shape of the aedeagus.

Distribution. The only known specimen of *P. superficialia* sp. n. was found in the leaf litter of the forest of rubber trees near the center of Yaoqu, a town in Mengla County, Yunnan. It was collected in October by sifting leaf litter at an altitude of 1030 m.

Records of the genus *Pseudolathra* species from China

Pseudolathra bipectinata Assing, 2013, first record for the territory of China

http://species-id.net/wiki/Pseudolathra_bipectinata

Material examined. 4♂♂, 3♀♀, **Yunnan**, County Jinghong, Nabanhe Nature Reserves 730 m, 16.IV. 2009, leg. Lingzeng Meng; 1♂, 3♀♀, same data but 770 m, 6.IV.2009; 2♂♂, 3♀♀, same data but 710 m; 2♂♂, 3♀♀, same data but 730 m, 6.VI.2009; 3♂♂, 2♀♀, same data but 760 m, 6.IV.2009; 1♂, 1♀, same data but 770 m; 2♂♂, 3♀♀, same data but 800 m, 16.IV.2009; 3♂♂, 3♀♀, same data but 1110 m, 16.V.2009 (IZCAS, ZMUC).

Comments. *Pseudolathra bipectinata* is illustrated and its distribution mapped in Assing (2013: figures 17–23, map 3). It was previously known only from Laos. The above specimens collected at altitudes between 200 and ca. 1000 m in southern China represent a new county record.

Pseudolathra lineata Herman, 2003

http://species-id.net/wiki/Pseudolathra_lineata

Specimens examined. 1♀, 1♂, **Sichuan**, City Luzhou, 4.VI.1974, leg. Yinheng Han (IZCAS).

Comments. The previously known distribution of *P. lineata* Herman included Japan, as well as Taiwan and the mainland Chinese province, Jiangsu (Assing 2012). The above record from Sichuan represents a new province record.

Pseudolathra pulchella (Kraatz, 1859)

http://species-id.net/wiki/Pseudolathra_pulchella

Material examined. **Hainan**, 3♂♂, 5♀♀, Qiongzong City, Limu Shan 600 m, 15.V.2007, leg. Zongyi Zhao; 1♀, Lishui, Diaoluo Shan (light trap, 18.66N, 109.93E) 60 m, 24.III.2007, leg. Hongliang Shi and Feng Yuan; 3♂♂, 2♀♀, **Guangdong**, Cheba Shan, Nature Reserve Conservation Zone, 370 m, 22–26.VII.2008, leg. Zhuo Yang (IZCAS, ZMUC).

Comments. The morphology of *Pseudolathra pulchella* was redescribed by Assing (2012); an updated distribution map was provided by Assing (2013). The above specimens represent new province records from Hainan and Guangdong.

***Pseudolathra regularis* (Sharp, 1889)**

http://species-id.net/wiki/Pseudolathra_regularis

Specimens examined. 3♀♀, 2♂♂, **Beijing**, Haidian, Yingtaogou, 19.V.1997, leg. Haisheng Zhou; 1♂, Changping, 20.X. 1988, leg. Huiying Wang; 1♀, Haidian, Qionglongqiao, 15.V.1997, leg. Haisheng Zhou; 1♀, Haidian, Jiufeng, 3.VII.1997, leg. Haisheng Zhou; 1♀, Haidian, Anheqiao, 13.VI.1996, leg. Haisheng Zhou (IZCAS, ZMUC).

Comments. Previously, this species was known from Japan, and from the southern and western parts of China (Jiangsu, Yunnan, Shaanxi, and Sichuan) (Assing 2012, 2013). The above material expands the known distribution of *P. regularis* to northern China.

***Pseudolathra transversiceps* Assing, 2013**

http://species-id.net/wiki/Pseudolathra_transversiceps

Specimens examined. ♂, **Hainan**, Bawang Shan, 1000 m, 28.XI.2009, leg. Zongyi Zhao; ♂, **Yunnan**, City Jinghong, County Menghai, Nabanhe nature reserve conservation zone, 1110 m, 16.III.2009, leg. Lingzeng Meng (IZCAS, ZMUC).

Comments. *Pseudolathra transversiceps* was previously known only from Vietnam (Assing 2013, map 4). The examined specimens from southern China, which were collected at altitudes ranging from 400 to 1000 m, expand the known distribution northwards.

***Pseudolathra unicolor* (Kraatz, 1859)**

http://species-id.net/wiki/Pseudolathra_unicolor

Specimens examined. 3♀♀, **Yunnan**, Xishuangbanna Yaoqu, 5.VIII.2006, leg. Gang Yao; 1♂, Xishuangbanna Xiaomengyang 850 m, 20.VIII.1958, leg. Yiran Zhang; 2♀♀, Luxi, 24.VI.1958; 2♀♀, **Jiangxi**, Dongxiang, 6.VII.1957, leg. Xuewen Ying; 1♀, Huichang, 20.VI.1959; 1♀, **Fujian**, Shaowu, 1980, leg. Zhanghong Qiu; 1♀, **Guangxi**, Guilin, Yan Shan, 12.V.1963, leg. Chunguang Wang; 1♀, Guangdong, Boluo Xiangshui, 30.V.1965, leg. Youwei Zhang; 6♀♀, 2♂♂, **Tonkin**, Hoa-Binh, 1940, leg. A. de Cooman (IZCAS, ZMUC).

Comments. *Pseudolathra unicolor* is a widespread species, its distribution ranging from the Himalaya deep into the Oriental region (Assing 2012, 2013). The above mentioned material indicates that it is common and widespread in southern China (Jiangxi, Guangxi and Fujian).

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The “*Taygetis ypthima* species group” (Lepidoptera, Nymphalidae, Satyrinae): taxonomy, variation and description of a new species

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| <http://zoobank.org/35E87F13-0B94-4925-B44A-F6F80545BB5B>

¶ <http://zoobank.org/4E0FFE51-850C-4E51-AC9A-6B5552377C0B>

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Abstract

A new species of *Taygetis* Hübner, [1819] (Lepidoptera, Nymphalidae, Satyrinae) from southeastern Brazil is described: *Taygetis drogoni* sp. n. In addition, *T. servius* Weymer, 1910 and *T. fulginia* d’Almeida, 1922 are resurrected from synonymy and a taxonomic discussion on the species *T. ypthima* Hübner, [1821] and *T. rectifascia* Weymer, 1907 is provided. A dichotomous key for the species is also provided.

Keywords

Atlantic Forest, Euptychiina, Neotropical, *Pseudodebis*, *Taygetis rectifascia*

Introduction

The butterfly subtribe Euptychiina includes over 400 described species in 45 genera, being one of the most diverse groups in the subfamily Satyrinae (Lepidoptera, Nymphalidae) (Lamas 2004, Peña et al. 2010, Zacca et al. 2013). This group is predominantly Neotropical, but some species also occur in the Nearctic region and in Southeast Asia (Peña et al. 2010, Matos-Maraví et al. 2013). The taxonomy of the group is among the most poorly known of all Neotropical butterflies, and the relationships within the subtribe are still in debate (Marín et al. 2011). Several genera are polyphyletic, new species and genera are regularly described, and the delimitation of the recognized genera and species needs much effort before a better understanding on the systematics of the group emerges (e.g. Freitas and Peña 2006, Freitas et al. 2011, in press, Zacca et al. 2013).

In a recent study based on molecular data, Peña et al. (2010) proposed a phylogenetic hypothesis of Euptychiina, and defined five major clades within this group. The “*Taygetis* clade” is one of those five major groupings and it includes 10 valid genera. A preliminary molecular phylogeny of the “*Taygetis* clade” (Matos-Maraví et al. 2013) gave insights on the non-monophyletic nature of most genera, and also revealed several new cryptic species waiting to be described. *Taygetis* appeared as polyphyletic, with *Taygetis kerea* Butler, 1869 and *Taygetis weymeri* Draudt, 1912 as part of the “*Taygetina* subclade”, and with the clade *T. ypthima*+*T. rectifascia* (hereafter “*Taygetis ypthima* species group”), as part of the “*Pseudodebis* subclade” (Matos-Maraví et al. 2013).

The genus *Taygetis* comprises 27 described species and several undescribed species (Lamas 2004), which are widely distributed throughout the neotropics, from Mexico to Uruguay (Lamas 2004, Marín et al. 2011). Adult *Taygetis* are mid-sized to large butterflies, with brown dorsal wings and with the ventral surface resembling dried leaves (D’Abrera 1988). Some species are crepuscular and are easily captured using rotting fruit in bait traps (Murray 2001a, b). A number of species of *Taygetis* show high apparent intraspecific phenotypic variation, and some species have been described several times. For example, *T. virgilia* (Cramer, 1776) has five synonymized names (Lamas 2004).

Although intraspecific phenotypic variation appears to be common in several Euptychiina, in some cases hidden taxonomic diversity might be underestimated. Similar to *T. virgilia* (see above), *T. ypthima* is a highly variable species that has five synonymized names (Lamas 2004).

The present paper studied in detail the morphology of male and female genitalia and wing pattern variation of *T. ypthima*, and related species, such as its sister species *Taygetis rectifascia* Weymer, 1907 (Matos-Maraví et al. 2013). As a result, a new species of *Taygetis* from Brazil is described, and *T. servius* Weymer, 1910 and *T. fulginia* d’Almeida, 1922, synonyms of *T. rectifascia* and *T. ypthima* respectively (see Lamas 2004), were revalidated.

Methods

Dissections of the genitalia were made following standard techniques. The abdomen was removed, soaked in a heated 10% KOH solution for 5 minutes before dissection of the genitalia to analyze its structures. Illustrations were prepared with the aid of a camera lucida attached to a stereoscopic microscope. Genitalia terminology follows Oiticica-Filho (1946) and Niculescu (1972-1983). Distributional data were obtained from seven entomological institutions (see below) and, when possible, from the literature (Biezanko 1960, Ebert 1969, Kochalka et al. 1996, Krüger and Silva 2003, Iserhard and Romanowski 2004, Quadros et al. 2004, Uehara-Prado et al. 2004, Giovenardi et al. 2008, Paz et al. 2008, Bonfanti et al. 2009, Iserhard et al. 2010, Peña et al. 2010, Dolibaina et al. 2011, Pedrotti et al. 2011, Santos et al. 2011, Soares et al. 2011, Bellaver et al. 2012, Silva et al. 2012). Ventral and dorsal wings surfaces were photographed and their patterns compared to original descriptions. All previously described taxa were studied in detail, including photographs of type specimens and original descriptions. Dissections were made for individuals corresponding to all observed variation, including phenotypes corresponding to all available names for the species in this group.

All examined material belongs to the following institutions:

DZUP	Coleção Entomológica Padre Jesus Santiago Moure, Curitiba, Paraná, Brazil
UFMG	Universidade Federal de Minas Gerais taxonomic collection, Belo Horizonte, Minas Gerais, Brazil
ZUEC	Museu de Zoologia Adão José Cardoso, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil
ZUEC-AVLF	André VL Freitas Collection, Universidade Estadual de Campinas, Campinas, São Paulo, Brazil
SMFL	Lepidoptera collection, Senckenberg-Museum, Frankfurt am Main, Germany
SMT	Staatliches Museum für Tierkunde, Dresden, Germany
ZSM	Zoologische Staatssammlung München, Germany

Results

Taygetis drogoni Siewert, Zacca, Dias & Freitas, sp. n.

<http://zoobank.org/CA6CEBB1-A525-44EE-A265-CE467707BFB5>

http://species-id.net/wiki/Taygetis_drogoni

Figs 1A–D; 6A–E; 7A,B

Type material. Holotype male with the following labels (separated by transverse bars): /HOLOTYPUS/ *Taygetis drogoni* Siewert, Zacca, Dias & Freitas det. 2013/ M(#)/ 07-



Figure 1. Adults of *Taygetis drogoni* sp. n. **A–B** male **A** dorsal view **B** ventral view **C–D** female **C** dorsal view **D** ventral view. Scale bar = 1 cm.

II-1985 Cambuquira, M[inas] G[erais] [21°51'30"S, 45°17'28"W]. Mielke & Casagrande leg./ DZ 27.604/ (DZUP). Allotype female with the following labels (separated by transverse bars): /ALLOTYPUS/ *Taygetis drogoni* Siewert, Zacca, Dias & Freitas det. 2013/ F(#)/ 10-XII-1968 Camb[uquira], [Minas Gerais] [21°51'30"S, 45°17'28"W]./ Coleção H. Ebert/ DZ 27.607/ (DZUP).

Paratypes. BRAZIL – *Minas Gerais*: **Alfenas** – 14-XII-2011, 1 female, Brito leg., JCI2.1-130 (ZUEC); 08-II-2012, 1 male, Brito leg., JCI3.2-225 (ZUEC). **Cambuquira** – 6-X-1968, 1 female, Ebert leg., ex-coll. Ebert, DZ 5.501 (DZUP); 10-XII-1968, 6 males, Ebert leg., ex-coll. Ebert, DZ 27.606, DZ 27.607, DZ 27.614, DZ 27.619, DZ 27.623, DZ 27.624 (DZUP); 900 m, 15-IV-1969, 3 males, Ebert leg., ex-coll. Ebert, DZ 27.605, DZ 26.419, DZ 27.620 (DZUP); 2-7-XI-1969, 1 female, Ebert leg. (SMFL); 15-V-1981, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.618 (DZUP); 7-II-1985, 5 males, Mielke & Casagrande leg. DZ 27.621, DZ 27.431, DZ 27.616, DZ 27.626, DZ 27.627 (DZUP). **Caraca** – Santa Barbara, 1500 m, 1-5-II-1985, 1 male

and 1 female, Mielke & Casagrande leg. DZ 27.625, DZ 27.629 (DZUP). **Carmo do Rio Claro** – 1-VIII-1948, 1 male, Carvalho & Alceu leg. DZ 27.617 (DZUP). **Nova Lima** - APE Manancial Mutuca, Parque Estadual da Serra do Rola Moça, 1-V-2009, 1 male, Silva leg., DNA voucher PM 10-02 (ZUEC-AVLF). **São Roque de Minas** – Parque Nacional Serra da Canastra, 9-IV-1999, 1 male, without collector, UFMG ILE 1300506 (UFMG); 19-21-IV-1999, 2 males, without collector, UFMG ILE 1300504, 1300507 (UFMG). **São Paulo: São Luiz do Paraitinga** – 800 m, 22-IV-2004, 1 male, Ribeiro leg., ZUEC LEP 6.548 (ZUEC); 28-IX-2004, 1 male, Ribeiro leg., ZUEC LEP 6.548 (ZUEC); 29-IX-2004, 1 male, Ribeiro leg., ZUEC LEP 7.003 (ZUEC); 12-I-2005, 1 female, Ribeiro leg., ZUEC LEP 6.724 (ZUEC); 18-II-2005, 2 males, Ribeiro leg., ZUEC LEP 6.666, ZUEC LEP 6.691 (ZUEC).

Diagnosis. *Taygetis drogoni* sp. n. is very similar to *T. ypthima*, differing from the latter by the following characters: forewing with pale brown dorsal post discal band less contrasting than in *T. ypthima*; underside pale post discal band slightly constricted at M_3 , tapering abruptly in CuA_1 - CuA_2 and becoming conspicuously thinner or even absent from CuA_2 to the inner margin; hind wing underside with the discal line evenly curved and regular, extending from the costal margin to 1A; and dark post discal line straight and only slightly irregular. Tegumen larger and protruding; valva stouter and shorter, with a larger dorsal rough area. Signa dorsal; laterally, sternum VIII not fused with tergum VIII; lamella antevaginalis without process.

Description. *Head.* Brown. Post-genal area light brown. Eye glabrous, brown. Antennae without scales at apical third, mostly light brown; club dark brown with last flagellomere light brown. Labial palpus mixed with brown and light brown, with elongated scales at first and second segment; about 1.5 times total length of eye; third segment thin, same size as first. *Thorax.* Uniformly brown. Legs brown; meso- and metathoracic femurs light brown on inside. *Forewing, size and shape:* length: 34.5–37.0 mm (n = 23). Triangular, costal margin convex, apex pointed, outer margin convex, tornus rounded, inner margin straight. *Forewing upper side* (Fig. 1A,C). Mostly brown, darker along outer margin. *Forewing under side* (Figs 1B,D). Background brown, lighter at wing base. Dark brown scales at end of discal cell and whitish on transverse veins. Dark spot at base of M_2 . Costal margin to external margin with reticulated markings. Apex rufous brown. Submarginal band whitish, from costal to inner margin, with reduced creamy ocelli in spaces R_5 - M_1 , M_1 - M_2 , M_2 - M_3 and M_3 - CuA_1 ; proximal border of submarginal band irregular with dark brown scaling, distal border of marginal band inconspicuous. Marginal line brown. Fringe light brown. *Hind wing shape:* Costal margin convex, apex rounded, external margin convex in M_1 - M_2 , projections at CuA_1 , CuA_2 and 2A, with a developed one at M_3 . Inner margin curved at base, slightly straight towards tornus. *Hind wing upper side* (Fig. 1A,C). Mostly brown, darker along outer margin. *Hind wing under side* (Fig. 1B,D). Background rufous brown, discal line dark brown and irregular. Dark brown spot at base of M_2 . Submarginal band with reduced creamy ocelli, in spaces R_s - M_1 , M_1 - M_2 , M_2 - M_3 and M_3 - CuA_1 , ocellus on CuA_1 - CuA_2 developed. Post discal line straight and dark brown. Proximal border of submarginal band along post discal line forming a 2 mm wide reddish fascia. Distal

border of marginal band inconspicuous. Marginal line brown, with distal area reddish. Fringe light brown. *Abdomen*. Dorsally brown, ventrally light brown.

Male genitalia (Fig. 6A–E). Tegumen dorsally convex, subtriangular in lateral view, ventral projection wide; appendix angular reduced. Uncus straight, down curved at apex and dorsally keeled. Gnathos larger than uncus; straight and projected dorsally, without a ventral projection at base. Anterior projection of saccus cylindrical, length equal to tegumen. Valva subrectangular, with dorsal projections at apical third; costa developed and subtriangular; ventrally covered by setae. Aedeagus straight, thin and larger than valva; opening of aedeagus almost the total length of posterior portion.

Female genitalia (Fig. 7A, B). Tergum VIII squared. Papillae anales with setae at distal portion, 2/3 higher than longer, sclerotized at basal half. Sterigma sclerotized, formed by a round lamella antevaginalis and a membranous pocket between ostium bursae and papilla anales. Bursa copulatrix totally membranous, with a pair of signa dorsally; ductus bursae thinned, with apical third sclerotized, about three times length of bursa copulatrix.

Etymology. The specific epithet refers to Drogon, one of the three dragons of Daenerys Targaryen, a fictional character from the George R. R. Martin's novel "A Song of Ice and Fire".

Distribution (Fig. 8). This species occurs in southeastern Brazil (Minas Gerais and São Paulo) at elevations from 800 to 1,500 m a.s.l.

Taxonomic comments. This species has presumably not been recognized in the past because of the intrinsic phenotypic variation within *Taygetis* and, in particular, within *T. ypthima*, the most similar and probably closest species to *Taygetis drogoni* sp. n. The species appears cited as *T. ypthima* in Ribeiro et al. (2012). In Matos-Maraví et al. (2013), *Taygetis ypthima* PM10-02 is in fact *T. drogoni* (one of the paratypes, see above). A real *T. ypthima* (*Taygetis ypthima* NW 149-8) is also included in that study, and it appears as sister to *T. drogoni* in the phylogeny presented in that paper. The genetic distances between these two specimens in the available COI and nuclear genes provide further support for the description of *T. drogoni* sp. n.

Taygetis ypthima Hübner, [1821]

http://species-id.net/wiki/Taygetis_ypthima

Figs 2A–H; 6F–J; 7C,D

Examined material. BRASIL – *Bahia*: **Jitaúna** – 25-III-1969, 1 female, Ebert leg., ex-coll. Ebert, DZ 27.720 (DZUP). Rio de Contas, 150 m, 4-III-1969, 1 female, H. Ebert leg., ex-coll. Ebert, DZ 27.721 (DZUP). *Minas Gerais*: **Alfenas** – 27-I-2012, 1 male, Brito leg., VPI2.2-214 (ZUEC). **Camanducaia** – Monteverde, 1650m, 8-II-1979, Ebert leg., ex-coll. Ebert, DZ 27.646 (DZUP); **Cambuquira** – 10-XII-1968, 1 male and 1 female, Ebert leg., ex-coll. Ebert, DZ 27.432, DZ 26.433 (DZUP); 12-X-1968, 1 female, Ebert leg., ex-coll. Ebert, DZ 26.434 (DZUP); 15-IX-1969, 1 female, Ebert leg., ex-coll. Ebert, DZ 27.647 (DZUP); **Conceição dos Ouros** – Rio Sapucaí, 24-II-1968, 1 female,

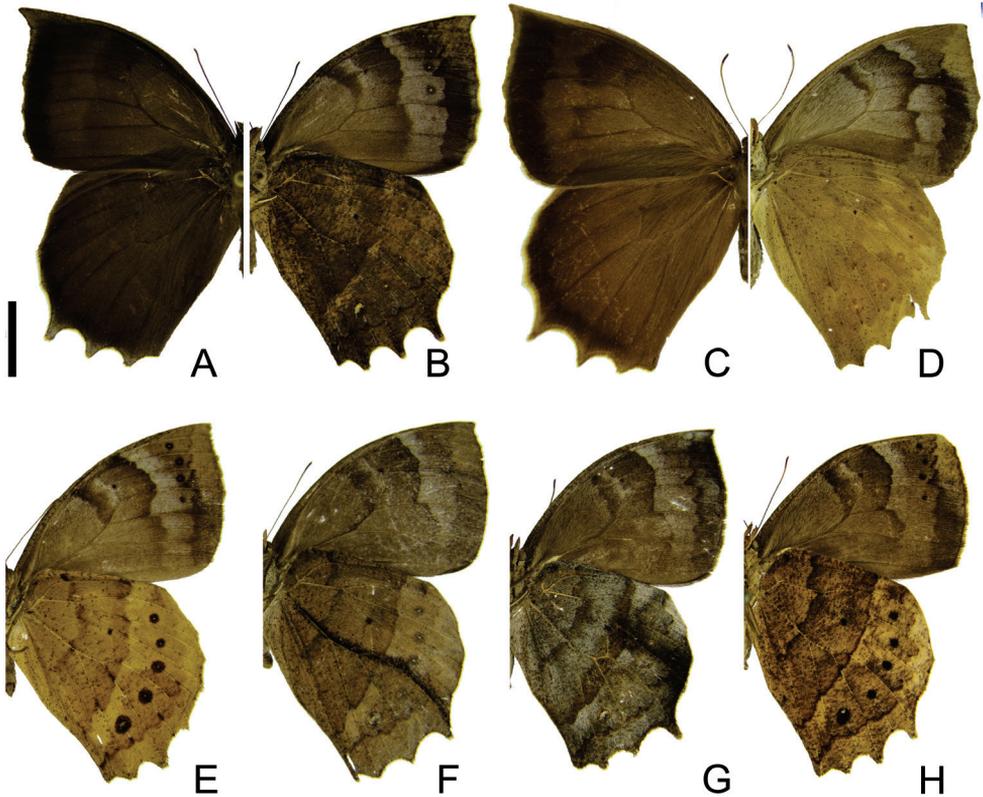


Figure 2. Adults of *Taygetis ypthima*. **A–B** male **A** dorsal view **B** ventral view **C–D** female **C** dorsal view **D** ventral view **E–H** variations in ventral view. Scale bar = 1 cm.

Ebert leg., ex-coll. Ebert, DZ 27.648 (DZUP); **Marliéria** – Parque Estadual do Rio Doce, 200 m, 08-IX-1972, 1 female, Ebert leg., ex-coll. Ebert, DZ 27.718 (DZUP); 16-III-1972, 1 male, H. & H. D. Ebert leg., ex-coll. Ebert, DZ 27.719 (DZUP). **Itamonte** – Vargem Grande, 1600m, 17-II-2010, 1 male, Mielke & Casagrande leg., DZ 27.554 (DZUP); NE side of Itatiaia, 1300m, II-1959, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.671 (DZUP); **Passa Quatro** – Paiolinho, Fazenda Serra Fina, 1600m, 16-II-2010, 1 male, Mielke & Casagrande leg., DZ 27.645 (DZUP); **Virgínia** – Fazenda dos Campos, 1500m, 13-15-II-2010, Mielke & Casagrande leg., DZ 27.540 (DZUP). **Rio de Janeiro: Nova Friburgo** – 1000m, 23-I-1983, 1 female, O.-C. Mielke leg., DZ 27.644 (DZUP); **Itatiaia** – 900m, 23-I-1936, 1 male, Gargarin leg., ex-coll. Gargarin, DZ 27.472; II-1958, 2 male, Ebert leg., ex-coll. Ebert, DZ 27.634, DZ 27.635 (DZUP); 1600m, 14-II-1956, 1 male and 2 females, Ebert leg., ex-coll. Ebert, DZ 27.637, DZ 27.638, DZ 27.639 (DZUP); Parque Nacional do Itatiaia, Maromba, 1100m, 06-09-II-2011, 1 female, Freitas leg., ZUEC LEP 5.372 (ZUEC); **Petrópolis** – Independência, 900m, 13-III-1933, 1 male, Gargarin leg., ex-coll. Gargarin, DZ 27.655 (DZUP); **Rio de Janeiro** – 14-XI-1920, 1 male, D’Almeida leg., ex-coll. D’Almeida, DZ 27.654 (DZUP); **Teresópolis** – 1600m,

20-II-1967, 1 female, Ebert *leg.*, ex-coll. Ebert, DZ 27.637 (DZUP). *São Paulo*: **Apiáí** – IV-1972, 1 male, Ebert *leg.*, ex-coll. Ebert, DZ 27.636 (DZUP); **Campos do Jordão** – I.1966, 5 males and 3 females, without collector, DZ 27.369, DZ 27.579, DZ 27.588, DZ 27.589, DZ 27.591, DZ 27.597, DZ 27.602, DZ 27.603 (DZUP); 1600-2000m, 8-12-II-1982, 2 males, Mielke & Casagrande, DZ 27.587, DZ 27.595 (DZUP); Parque Estadual Campos do Jordão, 1950m, 10-II-1968, 2 males, Mielke, Brown & Laroca *leg.*, DZ 27.593, DZ 27.600 (DZUP); 1800m, 11-12-I-2001, 1 female, Brown & Freitas *leg.* (ZUEC-AVLF); **Capão Bonito** – Fazenda Intervalas, Sede, 950-1100m, 30-XII-1989, 1 female, Freitas *leg.* (ZUEC-AVLF); 15-II-2000, 2 females, Brown, Freitas, Francini & Uehara-Prado *leg.*, ZUEC LEP 1.776 (ZUEC); 13-XII-2000, 1 male and 1 female, Brown, Freitas, Francini & Uehara-Prado *leg.*, ZUEC LEP 4.731, ZUEC LEP 4.732 (ZUEC); 5-6-XII-2001, 1 male and 1 female, Brown & Freitas *leg.* (ZUEC-AVLF); 15-I-2002, 1 female, Brown, Freitas, Francini & Uehara-Prado *leg.*, ZUEC LEP 802 (ZUEC); 17-I-2003, 2 males and 2 females, Brown, Freitas, Francini & Uehara-Prado *leg.*, ZUEC LEP 1.028, ZUEC LEP 1.547, ZUEC LEP 1.548, ZUEC LEP 1.549 (ZUEC); 19-I-2003, 3 males, Brown, Freitas & Uehara-Prado *leg.*, ZUEC LEP 1.180, ZUEC LEP 1.286, ZUEC LEP 1.305 (ZUEC); **Cotia** – Morro Grande, 900-1100m, 15-III-2000, 1 female, Uehara-Prado & Freitas *leg.* (ZUEC-AVLF); 22-XII-2000, 1 female, Brown & Uehara-Prado *leg.*, ZUEC LEP 1.781 (ZUEC); **Imbariê** – 7-I-1956, 1 female, Ebert *leg.*, ex-coll. Ebert, DZ 27.633 (DZUP); **Jundiáí** – Serra do Japi, 11-V-2012, 1 female, Santos *leg.*, BLU 246 (ZUEC); **Piquete** – Barreira de Piquete, 1400-1600m, 15-II-1984, 2 males, Mielke & Casagrande *leg.*, DZ 27.585, DZ 27.596 (DZUP); **Presidente Ven-ceslau** – without date, 2 males and 4 females, D’Almeida *leg.*, DZ 27.656, DZ 27.657, DZ 27.658, DZ 27.659, DZ 27.660, DZ 27.661 (DZUP); **Rio Claro** – 60m, 6-I-1964, 5 males and 1 female, Ebert *leg.*, ex-coll. Ebert, DZ 27.392, DZ 5.500, DZ 27.663, DZ 27.630, DZ 27.631, DZ 27.632 (DZUP); 16-V-1965, 1 male, Ebert *leg.*, ex-coll. Ebert, DZ 27.662 (DZUP); **Salesópolis** – Estação Biológica da Boraceia, 900m, 21-II-2006, 1 male, Uehara-Prado & Freitas *leg.* (ZUEC-AVLF); 27-III-2006, 1 male, Uehara-Prado & Freitas *leg.* (ZUEC-AVLF); **Umuarama** – 1800m, 8-15-III-1937, 8 males and 2 females, Gargarin *leg.*, ex-coll. Gagarin, DZ 27.584, DZ 27.586, DZ 27.590, DZ 27.592, DZ 27.593, DZ 27.594, DZ 27.598, DZ 27.599, DZ 27.601, DZ 27.632 (DZUP). *Paraná*: **Foz do Iguaçu** – 250m, 17-II-1969, 3 males, Moure & Mielke *leg.*, DZ 26.741, DZ 1.626, DZ 27.368 (DZUP); 10-X-1969, 1 male, Krause *leg.*, DZ 26.740 (DZUP); Parque Nacional do Iguaçu, 21-24-IV-1996, 2 females, Mielke & Casagrande *leg.*, DZ 26.743, DZ 26.769 (DZUP); **Curitiba** – 900m, 20-III-1980, 1 male, O. Mielke *leg.*, DZ 27.405 (DZUP); Uberaba, Tirol das Torres, 900m, 5-II-2010, 1 female, O. Mielke *leg.*, DZ 26.742 (DZUP); **Rolândia** – Rio Tibagi, 750m, XII-1941, 1 male, Waltz *leg.*, DZ 27.397 (DZUP). *Santa Catarina*: **Canoinhas** – I, 1 male, Pohl *leg.*, DZ 27.667 (DZUP); 16-IX-1941, 1 male, Schimith *leg.*, DZ 27.668 (DZUP); **Ibirama** – I, 1 male, Pohl *leg.*, DZ 27.666 (DZUP); VIII, 1 female, Pohl *leg.*, DZ 27.670 (DZUP); XII, Pohl *leg.*, DZ 27.669 (DZUP); **Itaiópolis** – 26-III-1937, 1 male, D’Almeida *leg.*, ex-coll. D’Almei-da, DZ 27.549 (DZUP); **Itajaí** – Agrolândia, 400m, II-1973, 1 female, Wulff *leg.*, DZ 27.665 (DZUP); **Joinville** – 5-III-1974, 1 male, O. Mielke *leg.*, DZ 26.778 (DZUP);

São Bento do Sul – Rio Vermelho, 850m, 10-IV-1980, 1 female, Rank leg., DZ 27.640 (DZUP); 950m, 23-I-1982, 1 male, Rank leg., DZ 26.815 (DZUP); 650m, 30-I-1982, 1 male, Rank leg., DZ 26.816 (DZUP); 850m, 7-XII-1969, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.649 (DZUP); 8-I-1971, Ebert leg., ex-coll. Ebert, DZ 27.643 (DZUP); 10-I-1971, 1 female, Ebert leg., ex-coll. Ebert, DZ 27.641 (DZUP); 7-VIII-1971, Ebert leg., ex-coll. Ebert, DZ 27.650 (DZUP); 3-X-1971, 1 female, Ebert leg., ex-coll. Ebert, DZ 5.499 (DZUP); 5-XII-1969, 1 male and 1 female, Ebert leg., ex-coll. Ebert, DZ 27.642, DZ 27.651 (DZUP); 6-XII-1969, 1 male and 1 female, Ebert leg., ex-coll. Ebert, DZ 26.429, DZ 27.653 (DZUP); 4-III-1980, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.652 (DZUP); 8-V-1980, 1 male, Rank leg., DZ 27.664 (DZUP); **Taió** – February, 1 male, Pohl leg., DZ 27.666 (DZUP). *Rio Grande do Sul: São José do Inhacorá* – Alto Uruguai, 2-V-1980, 1 male, Steiniger leg., DZ 26.770 (DZUP). PARAGUAY – *General Dias: Itaquiri* – 400m, 15-20-I-1980, 5 males and 5 females, O.-C. Mielke & Myers leg., DZ 27.708, DZ 27.709, DZ 27.710, DZ 27.711, DZ 27.712, DZ 27.713, DZ 27.714, DZ 27.715, DZ 27.716, DZ 27.717 (DZUP). ARGENTINA – *Corrientes: Santo Tomé* – I-1924, 1 male, D’Almeida leg., ex-coll. D’Almeida, DZ 27.522 (DZUP). *Misiones: General Manuel Belgrano* – Almirante Brown, Reserva Yacutinga, 2-5-III-2007, 1 male, Mielke & Casagrande leg., DZ 27.531 (DZUP). *Tucumán: Ibatim* – Pueblo Viejo, 850m, 25-I-1970, 1 female, O. Mielke leg., DZ 27.707 (DZUP).

Diagnosis. *T. ypthima* can be distinguished from *T. drogoni* by the forewing underside submarginal band, not conspicuously constricted at M_3 ; the proximal line is oblique in M_3 - CuA_1 to the direction of the base of the wing, disjointed of the remainder of the line from CuA_1 to the inner margin; submarginal band irregular, but about the same width from M_1 to the inner margin, sometimes slightly wider at M_3 - CuA_1 ; hind wing underside with the discal line curved and irregular, extending from the costal margin to the inner margin; and proximal line of the submarginal band distinctly curved and irregular. Tegumen smaller; valva thinner and longer, with a smaller dorsal rough area. Signa ventral; laterally, sternum VIII fused with tergum VIII; lamella antevaginalis with two lateral process.

Distribution (Fig. 8). Occurs in northeastern, southeastern and southern Brazil, and also in Paraguay and Argentina, from sea level to 2000 m a.s.l. Based on label data, adults are present all year round.

Taxonomic comments. This is the commonest and more widespread species of the group. The high intraspecific variation observed in *T. ypthima* yield a number of descriptions of local forms or synonyms: *T. xantippe* Butler, [1870], *T. ophelia* Butler, 1870; *T. ophelia* f. *semibrunnea* Weyermer, 1910 and *T. ypthima* [sic] ab. *lineata* Kivirikko, 1936, all synonyms of *T. ypthima* (Lamas 2004; Warren et al. 2013). Based on collected specimens, different phenotypes associated with these taxonomic names frequently occur in a same locality. Furthermore, the genitalia of these specimens are exactly alike the genitalia of typical *T. ypthima*. Nonetheless, *Taygetis fulginia* D’Almeida, 1922, until recently considered a synonym of *T. ypthima* (Lamas *op. cit.*), is in fact a valid species, with clear differences on morphology of male and female genitalia and wing pattern (see below).

***Taygetis rectifascia* Weymer, 1907**

http://species-id.net/wiki/Taygetis_rectifascia

Figs 3A–G; 6K–O; 7E,F

Examined material. BRASIL – *Rio de Janeiro: Rio de Janeiro* – Mangaratiba - 12-VIII-1926, 1 female, D’Almeida leg., ex-coll. D’Almeida, DZ 26.426 (DZUP); **Itatiaia** - Parque Nacional do Itatiaia, 1200m, 25-II-1959, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.490 (DZUP); 1000-1200m, 25-VII-1963, 1 male, Ebert leg., ex-coll. Ebert, DZ 26.417 (DZUP); 1100m, 4-II-1966, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.469 (DZUP); 110m, 29-III-1967, Ebert leg., ex-coll. Ebert, DZ 5.502 (DZUP); 1000-1200m, 25-VII-1968, 1 male, Ebert leg., ex-coll. Ebert, DZ 27.346 (DZUP). *São Paulo: Capão Bonito* – Fazenda Intervalles, Sede, 950m, 28-XII-1989, 1 male, Freitas leg. (ZUEC-AVLF); 30-XII-1989, 1 male, Freitas leg. (ZUEC-AVLF); 15-II-2000, 3 males and 3 females, Brown, Freitas, Francini & Uehara-Prado leg., ZUEC LEP 1.777, ZUEC LEP 1.778, ZUEC LEP 1.779, ZUEC LEP 1.780, ZUEC LEP 1.782, ZUEC LEP 1.785 (ZUEC); 13-XII-2000, 3 males and 3 females, Brown, Freitas, Francini & Uehara-Prado leg., ZUEC LEP 4.730, ZUEC LEP 4.733, ZUEC LEP 4.734, ZUEC LEP 4.735, ZUEC LEP 4.736 (ZUEC); 5-6-XII-2001, 1 male and 4 females, Brown & Freitas leg. (ZUEC-AVLF); 17-20-I-2003, 3 males, Brown, Freitas & Uehara-Prado leg., ZUEC LEP 1.188, ZUEC LEP 1.189, ZUEC LEP 1.550 (ZUEC); **Salesópolis** – Estação Biológica da Boraceia, 900m, 28-IV-2006, 1 male, Uehara-Prado & Freitas leg. (ZUEC-AVLF); *Paraná: Campina Grande do Sul* – 13.III.1982, 2 males and 2 female, Mielke & Casagrande leg., DZ 26.430, DZ 27.519, DZ 27.532, DZ 27.534 (DZUP); *Santa Catarina: Taió* – I, 1 male, Pohl leg., DZ 27.382; **Presidente Getúlio** – Dalbérgia, 1 male, December, Pohl leg., DZ 26.425 (DZUP); **São Bento do Sul** – Rio Natal, IV-2012, 1 male, Rank leg., DZ 27.449 (DZUP).

Diagnosis. *T. rectifascia* can be distinguished from *T. fulginia* and other species of the genus by the following combination of characters: forewing pointed at the apex; hind wing, with small projections at M_3 , CuA_1 and CuA_2 ; dorsal wings brown with thin suffused dark brown bands about 2 mm away from and along the outer margin; ventral hind wing with the proximal border of the submarginal band and post discal line straight and slightly irregular, sometimes forming a creamy white fascia of varying width. The base of the gnathos presents a ventral pointed projection, similar to *T. fulginia* and *T. servius* stat. n. The male genitalia differ from all other species discussed in the present paper by the shape of the valvar end, which is bifid and claw-shaped (presenting large intraspecific variation).

Distribution (Fig. 8). Occurs in southeastern and southern Brazil (Rio de Janeiro, São Paulo, Paraná and Santa Catarina), at elevations from 300 to 1,200 m a.s.l. Based on label data, adults are present all year round.

Taxonomic comments. Despite its superficial resemblance to *T. fulginia*, this species presents a very distinctive genitalia. *T. rectifascia* presents strong intraspecific variation in the wing pattern, which in the past has motivated the description of several aberrations and forms: *Taygetis rectifascia* ab. *stigma* Weymer, 1907; *Taygetis rectifascia*

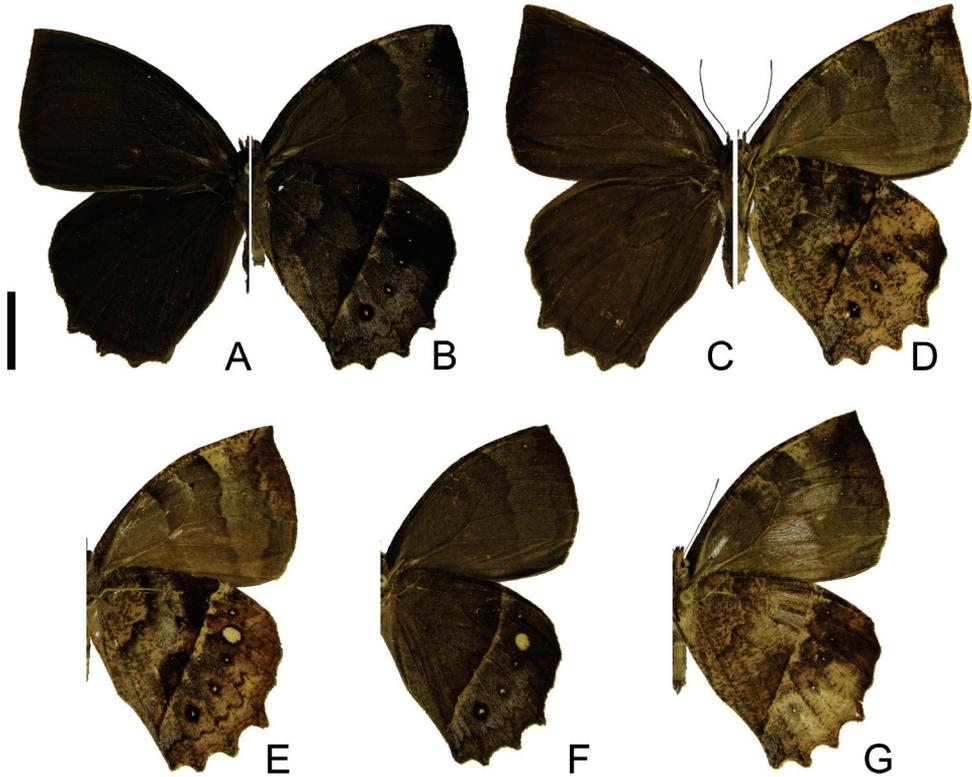


Figure 3. Adults of *Taygetis rectifascia*. **A–B** male **A** dorsal view **B** ventral view **C–D** female **C** dorsal view **D** ventral view **E–G** variations in ventral view. Scale bar = 1 cm.

ab. *latifascia* Weymer, 1907 (all synonyms of *T. rectifascia*) (Warren et al. 2013). *Taygetis epithyma* Forster, 1964 is a *nomem nudum*. The genitalia of these different phenotypes are alike the genitalia of typical *T. rectifascia*.

***Taygetis servius* Weymer, 1910, stat. n.**

Figs 4A–D, 6P–T; 7G–H

Examined material. BRAZIL – *Bahia: Jitaúna* - 26-III-1969, 2 males and 2 females, Ebert leg., ex-coll. Ebert, DZ 26.424, DZ 27.440, DZ 27.396, DZ 27.386 (DZUP). *Espírito Santo: Baixo Guandú* - 10-IV-1970, 1 male, Elias leg., DZ 26.806 (DZUP).

Diagnosis. *T. servius* stat. n. can be distinguished from *T. fulginia* stat. r. and *T. rectifascia* by the following characters: forewing rounded at the apex; dorsal wings light brown without any suffused dark brown bands along the outer margin; ventral hind wing with the proximal border of the submarginal band and post discal line straight and regular, forming a 2 mm wide creamy white fascia. The base of the gnathos presents a pointed ventral projection, as in *T. rectifascia* and *T. fulginia*, but differs from

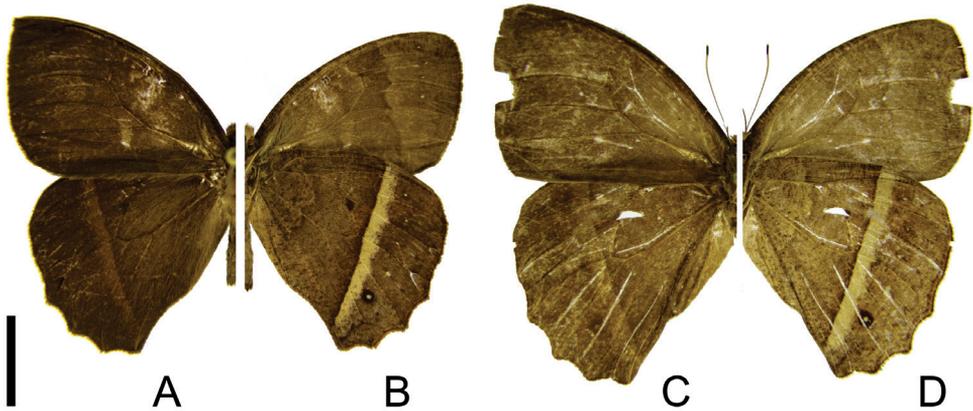


Figure 4. Adults of *Taygetis servius* stat. n. **A–B** male **A** dorsal view **B** ventral view **C–D** female **C** dorsal view **D** ventral view. Scale bar = 1 cm.

T. rectifascia by the absence of the claw-shaped bifid valva apex, and from *T. fulginia* by its stouter valva, with a shorter but wider distal projection of the valva. In addition, *T. servius* is considerably smaller than the other species treated in the present paper.

Distribution (Fig. 8). *T. servius* is known from Baixo Guandú (Espírito Santo), and from Jitaúna (Bahia). It should also be present in Minas Gerais (see below).

Taxonomic comments. *Taygetis servius* stat. n. was described from an unknown number of specimens from Minas Gerais, Brazil, as a form of *T. rectifascia* (Weymer, 1910: 187). Although clearly recognized as such, the illustration of *T. servius* (Weymer, 1910: pl. 46, fig. c [3]) is placed in another plate, separated from the rest of the illustrations of *T. rectifascia* and its forms (Weymer 1910: pl. 45, fig. a [1–2]). The description and the illustration matches exactly a series of five specimens from the states of Espírito Santo and Bahia, Brazil, deposited at the DZUP. Wing shape and pattern, also acknowledged by Weymer, and examination of the genitalia confirms it as a distinct species. The type specimen (or specimens) of *T. servius* is missing, however, type specimens of other species of *Taygetis* described by Weymer in the same fascicle of *Die Gross-Schmetterlinge der Erde* are housed at the SMT and ZSM collections (i.e. *T. mermeria* f. *cramerii* (Weymer, 1910), at SMT, and *Taygetina banghaasi* (Weymer, 1910), at ZSM). However, previous and recent searches for type specimens carried out by G. Lamas, O.H.H. Mielke and the curators of the above cited collections did not produce any specimens (Nekrutenko 2001).

***Taygetis fulginia* d’Almeida, 1922, stat. r.**

Figs 5A–D; 6U–Y; 7I,J

Type material. Holotype male with the following labels: /HOLOTYPUS/ *Taygetis fulginia* d’Almeida, 1922 /M(#)/ 30-X-1921 Parada Caramujos, E. F. C. B. [Estação de Ferro Central do Brasil] [Japeri] [22°38’34”S, 43°39’10”W] Estado do Rio [de Janeiro] Ferreira d’Almeida leg. /N°5163/ DZ 27.378/ (DZUP).

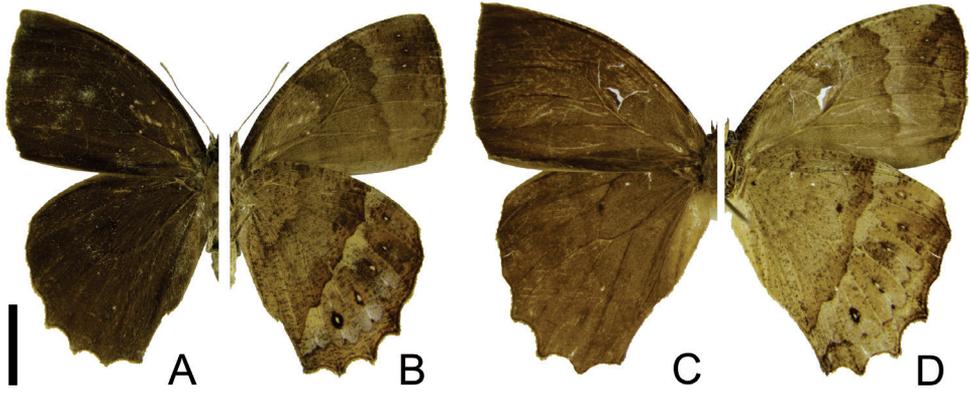


Figure 5. Adults of *Taygetis fulginia* stat. n. **A-B** male **A** dorsal view **B** ventral view **C-D** female **C** dorsal view **D** ventral view. Scale bar = 1 cm.

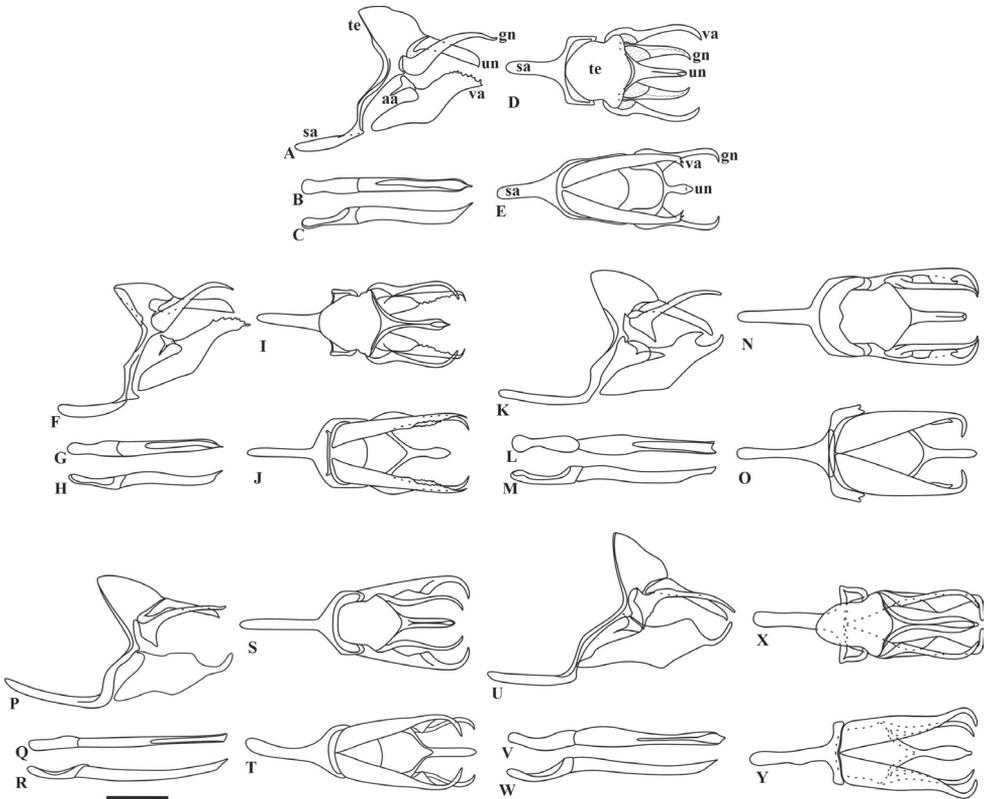


Figure 6. Male genitalia of *Taygetis*. **A-E** *T. drogoni* sp. n. **A** lateral view **B-C** aedeagus: **B** ventral **C** lateral **D** dorsal view **E** ventral view **F-J** *T. ypthima* **F** lateral view **G-H** aedeagus: **G** ventral **H** lateral **I** dorsal view **J** ventral view **K-O** *T. rectifascia* **K** lateral view **L-M** aedeagus: **L** ventral **M** lateral **N** dorsal view **O** ventral view **P-T** *T. servius* stat. n. **P** lateral view **Q-R** aedeagus: **Q** ventral **R** lateral **S** dorsal view **T** ventral view **U-Y** *T. fulginia* **U** lateral view **V-W** aedeagus: **V** ventral **W** lateral **X** dorsal view **Y** ventral view. Abbreviations: aa appendix angular; gn gnathos; sa saccus; te tegumen; un uncus; va valva. Scale bar = 1 mm.

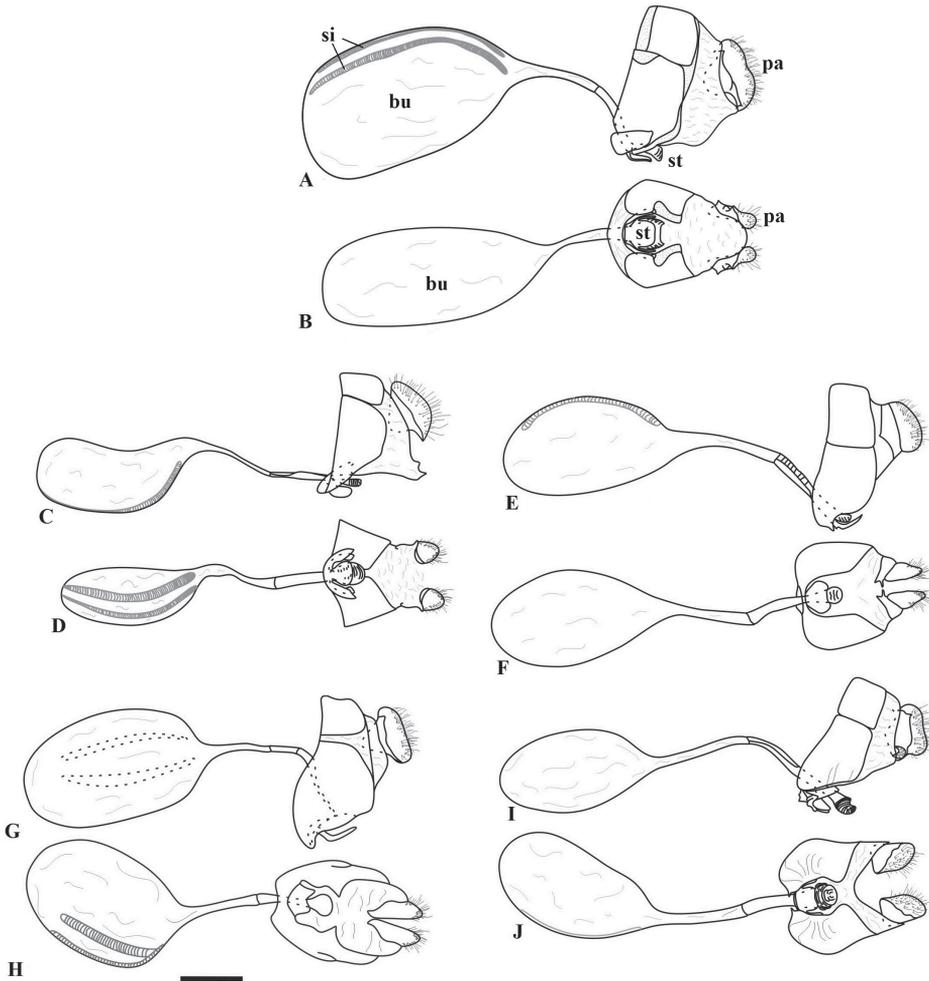


Figure 7. Female genitalia of *Taygetis*. **A–B** *T. drogoni* sp. n. **A** lateral view **B** ventral view **C–D** *T. ypthima* **C** lateral view **D** ventral view **E–F** *T. rectifascia* **E** lateral view **F** ventral view **G–H** *T. servius* stat. n. **G** lateral view **H** ventral view **I–J** *T. fulginia* **I** lateral view **J** ventral view. Abbreviations: **bu** corpus bursae; **pa** papilla analis; **si** signa; **st** sterigma. Scale bar = 1 mm.

Additional examined material. BRAZIL – *Minas Gerais*: **Marliéria** – Parque Estadual do Rio Doce, 250 m, 14-V-1974, 2 males, Ebert leg., ex-coll. Ebert, DZ 26.418, DZ 27.524 (DZUP); 17-V-1974, 1 male, Ebert leg., ex-coll. Ebert, DZ 26.821 (DZUP). *Rio de Janeiro*: **Rio de Janeiro** – Horto Florestal – 01-VIII-1932, 1 female, Gagarin leg., ex-coll. Gagarin, DZ 27.416 (DZUP). *São Paulo*: **Ubatuba** – Parque Estadual da Serra do Mar, Núcleo Picinguaba, 0–100m, 30-IX-2001, 1 male, Brown & Freitas leg. DNA voucher BLU 443 (ZUEC-AVLF).

Diagnosis. *T. fulginia* can be distinguished from *Taygetis ypthima* and other species of the genus by the following characters: in size it is slightly smaller, the forewing is only slightly pointed at the apex, the hind wing has smaller projections at M_3 , CuA_1 and CuA_2 ,

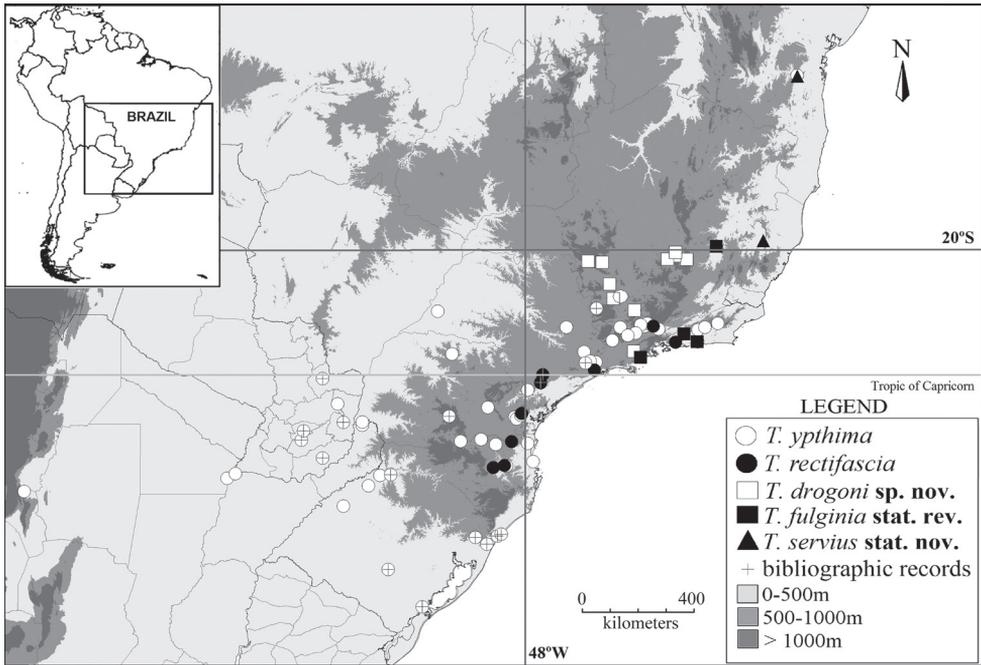


Figure 8. Geographical distribution of the species in the “*Taygetis ypthima* species group”.

similar to *T. servius* stat. n., the dorsal wings lack suffused dark brown bands along the outer margin. The base of the gnathos presents a ventral pointed projection, as in *T. rectifascia* and *T. servius* stat. n., but *T. fulginia* differs from the former by the absence of a developed dorsal projection on the valva, and from the latter by the longer and thinner distal projection of the valva, which is also longer and with a dorsally protruding area in *T. fulginia*.

Distribution (Fig. 8). This species occurs in southeastern Brazil (Minas Gerais, Rio de Janeiro and São Paulo), from sea level to 250m.

Taxonomic comments. The description of *T. fulginia* was based on a single specimen in the D’Almeida collection, now deposited at DZUP (see above). This species was previously considered a synonym of *T. ypthima*, but the morphological study confirms its specific status and indicates closer relationship with *T. rectifascia* and *T. servius* stat. n.

Key to males and females of the “*Taygetis ypthima* species group”

A combination of wing shape and color pattern permits identification of all five species without dissection, and genitalia of both sexes (not included here but discussed in the text) provide diagnostic characters for all species.

- 1 Forewing upper side with suffused dark brown marginal band developed (Figs 1A, C; 2A, C); hind wing with long projections at CuA₁, CuA₂ and 2A (Figs 1, 2) **2**

- Forewing upper side with suffused dark brown marginal band reduced (Fig. 3A, C) or absent (Figs 4A, C; 5A, C); hind wing with short projections at CuA₁, CuA₂ and 2A (Figs 3, 4, 5) **3**
- 2 Forewing underside submarginal band constricted at M₃ and reduced or absent in CuA₁-CuA₂ (Fig. 1B, D); hind wing underside with the discal line evenly curved and regular; dark post discal line straight and more or less regular (Fig. 1B, D) ***T. drogoni* sp. n.**
- Forewing underside submarginal band not constricted at M₃ (Fig. 2B, D); hind wing underside with the discal line irregular; post discal line distinctly irregular and not straight (Fig. 2B, D) ***T. ypthima***
- 3 Forewing apex conspicuously pointed (Fig. 3 A–G); forewing upper side with suffused dark brown marginal band reduced (Fig. 3A, C) ***T. rectifascia***
- Forewing apex rounded (Fig. 4A–D) or slightly pointed (Fig. 5A–D); forewing upper side with suffused dark brown marginal band absent (Figs 4A, C; 5A, C) **4**
- 4. Ventral hind wing with the proximal border of the submarginal band and post discal line straight and regular, forming an even 2 mm wide creamy white fascia; hind wing with projections at CuA₁, CuA₂ and 2A strongly reduced (Fig. 4B, D) ***T. servius* stat. n.**
- Ventral hind wing with the proximal border of the submarginal band and post discal line irregular, forming an irregular creamy white fascia (Fig. 5B, D) ***T. fulginia* stat. r.**

Discussion

The “*Taygetis ypthima* species group” is not part of the genus *Taygetis*, but in fact a clade related to the genus *Pseudodebis* Forster, 1964 (including *Taygetomorpha* L. D. Miller, 2004) in the “*Pseudodebis* subclade” of Matos-Maraví et al. (2013). Four species are certainly part of this clade based on molecular data, namely *T. ypthima*, *T. drogoni* sp. n. (= *Taygetis ypthima* PM10-02 of Matos-Maraví et al. 2013), *T. rectifascia* and *T. fulginia* stat. r., and one additional species was here treated as part of this group based on morphological similarities, *T. servius* stat. n.

The five species treated here can be easily distinguished from one another by wing pattern and genitalia, and two main subgroups can be identified based on morphology - group 1, composed of *T. ypthima* and *T. drogoni* sp. n., and group 2, composed by *T. rectifascia*, *T. fulginia* stat. r. and *T. servius* stat. n. Species in group 2 can be distinguished from those of the group 1 by bearing shorter tails at M₃, CuA₁ and CuA₂, by the lighter dorsal ground color of wings, and by a clear reduction (*T. rectifascia*) or total absence (*T. fulginia* stat. r. and *T. servius* stat. n.) of the suffused dark brown marginal bands. The base of the gnathos in the species of the group 2 presents a conspicuous ventral projection, and there is a longer saccus and aedeagus, and a relatively shorter posterior opening of the aedeagus. Wing color and pattern present conspicuous

intraspecific variability in all five species treated here, especially in *T. ypthima* and *T. rectifascia* (Warren et al. 2013), and thorough studies including additional sources of informative characters, e.g. molecular data, might reveal hidden taxonomic diversity.

Although species in the “*Taygetis ypthima* species group” are not part of the genus *Taygetis* (a fact also reinforced by karyological data, see Brown et al. 2007), a taxonomic revision of *Taygetis* and related taxa is not yet available. The lack of such revision is an impediment for eventual species delimitation and the assessment of intraspecific variation as well as the usage of generic synapomorphies. In addition, the diagnosis of many genera within Euptychiina have mostly relied on wing shape and pattern of genitalia (e.g. Forster 1964), making it a hard task to correctly assign species to a genus. As a result, most recent taxonomic rearrangements within Euptychiina are based on DNA sequence data. For example, *Taygetomorpha* L. Miller, 2004 has been recently synonymized with *Pseudodebis* Forster, 1964 (Matos-Maraví et al. 2013), based only on molecular data and larval morphology (Matos-Maraví et al. 2013, Murray 2001a), with no clear adult synapomorphies yet identified.

The present study revealed that morphological characters, such as wing shape and pattern, and male and female genitalia, were efficient to provide clear-cut species delimitation. However, further detailed morphological studies on Euptychiina are highly required to clarify the species and genera delimitations within the subtribe. As clear morphological keys are generated, several monophyletic groups are easily identified using informative synapomorphies (Freitas 2007, Freitas et al. 2010, Zacca et al. 2013). Nonetheless, because of this lack of information, the description of a new genus for the five species treated here would be premature.

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Taxonomic revision of the Trapdoor spider genus *Eucteniza* Ausserer (Araneae, Mygalomorphae, Euctenizidae)

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Abstract

The mygalomorph spider genus *Eucteniza* Ausserer, 1875 comprises 15 nominal species known only from the southwestern United States (Texas) and Mexico (Northern, Central, and the Baja Peninsula). *Eucteniza atoyacensis* Bond & Opell, 2002 is considered a nomen dubium; *E. rex* (Chamberlin, 1940) and *E. solida* (Gertsch & Mulaik, 1940) are both considered junior synonyms of *E. relata* (O.P.-Cambridge, 1895). Twelve new species are described: *E. caprica*, *E. coylei*, *E. diablo*, *E. cabowabo*, *E. huasteca*, *E. zapatista*, *E. chichimeca*, *E. ronnewtoni*, *E. hidalgo*, *E. golondrina*, *E. panchovillai* and *E. rosalia*.

Keywords

Biodiversity, New species, Spider taxonomy, *Eucteniza*, Euctenizidae, Mygalomorphae

Introduction

The trapdoor spider *Eucteniza* Ausserer, 1875 (subfamily Euctenizinae) is the most distinguishable of the genera currently placed in the recently recognized North American spider family Euctenizidae (see Bond et al. 2012). Known species have a unique mating clasper (modifications of the first walking leg) that comprises a mid-ventral tibial

megaspine with similar modifications to the second walking leg. Members of the genus also have a lightly sclerotized, “soft”, dorsal posterior aspect of the carapace that is very noticeable in live and preserved specimens. The distribution of the genus is largely restricted to the US state of Texas and northern/central Mexico (Fig. 1). As such, the habitat is predominantly low elevation, desert and tropical dry forest. The relatively few female specimens that have been hand collected were recovered from silk-lined burrows, reminiscent of *Ummidia* Thorell, 1875 (see Bond and Coyle 1995) – they have a thick silk lining and heavy “cork”-like trapdoor.

Phylogenetic placement of the genus has been historically problematic. Until recently, *Eucteniza* was the type genus for the cyrtaucheniid subfamily Euctenizinae (see Raven 1985, Bond and Hedin 2006). Morphological cladistic analyses (Bond and Opell 2002) and subsequent molecular phylogenetic analyses (Bond and Hedin 2006, Hedin and Bond 2006) clearly demonstrated Cyrtaucheniidae to be polyphyletic; imprecisely referenced as “possibly paraphyletic” by Platnick (2013) in the World Spider Catalog citing an older now superseded study by Goloboff (1993). The most recent multi-gene molecular phylogenetic analysis of the mygalomorph families by Bond et al. (2012) clearly supported a monophyletic Euctenizinae, which was sister to idiopids, and a polyphyletic Cyrtaucheniidae. Consequently the subfamily was elevated to family status and currently comprises seven genera: *Apomastus* Bond & Opell, 2002, *Aptostichus* Simon, 1891, *Entychides* Simon, 1888, *Eucteniza* Ausserer, 1875, *Myrmekiaphila* Atkinson, 1886, *Neoapachella* Bond & Opell, 2002, and *Promyrmekiaphila* Schenkel, 1950. Upon relimitation of the subfamily Euctenizinae by Bond et al. (2012), *Eucteniza* is considered more closely related to *Promyrmekiaphila*, *Neoapachella*, *Entychides*, and a potentially new genus from California. Although some analyses render *Entychides* paraphyletic with respect to *Eucteniza*, members of these two genera are very distinct morphologically and thus *Entychides* paraphyly is likely an artifact of limited sampling.

Like other euctenizid genera, the taxonomic history of *Eucteniza* is brief but does include a number of generic level synonyms. First described by Ausserer (1875), subsequent species were proposed but were all placed into other genera later considered by Bond and Opell (2002) to be junior synonyms. The North American species, *E. rex* (Chamberlin, 1940) and *E. stolidia* (Gertsch & Mulaik, 1940) were originally described as *Astrosoga* Chamberlin, 1940 taxa, a genus proposed by Chamberlin (1940) as closely allied with *Myrmekiaphila*. *Flavila* O.P.-Cambridge, 1895 and *Enrico* O.P.-Cambridge, 1895 were earlier names proposed for Mexican species; *Flavila* was shortly thereafter recognized as a junior synonym of *Eucteniza* by F.O.P.-Cambridge (1897) with the synonymy of *Enrico* following much later (Bond and Opell 2002).

We present here the first species level taxonomic revision of the genus *Eucteniza*; this is the tenth paper in a series of taxonomic revisions and reviews and phylogenetic treatments undertaken by the first author (JEB) seeking to resolve the taxonomy of the North American euctenizid genera and species (Bond and Opell 2002, Bond 2004, Bond and Hedin 2006, Bond and Platnick 2007, Stockman and Bond 2008, Bond and Stockman 2008, Bailey et al. 2010, Bond et al. 2012, Bond 2012). Unfortunately,

Eucteniza specimens are rare in collections and difficult to collect (Bond pers. obs.) thus with the exception of *Eucteniza relata* (distributed widely throughout Texas and Northern Mexico), most of the species described herein are based on relatively little material and most are known only from male specimens. Moreover, a number of species, to include the type species for the genus, were originally described from juvenile specimens; one such species, *E. atoyacensis* Bond & Opell, 2002 is considered herein a nomen dubium. Given the paucity of material it is our hope that this work will catalyze interest in the genus and facilitate future studies.

Species concept applied: Species were delineated using a traditional morphological species concept wherein species are defined as those populations (or groups of populations) that represent qualitative differences in phenotype that differ in a discrete manner from other populations or groups.

Materials and methods, abbreviations

The following institutional and quantitative morphological abbreviations used in this paper are defined as follows:

Institutional

AMNH (American Museum of Natural History; New York, New York), **AUMNH** (Auburn University Museum of Natural History; Auburn, Alabama), **BMNH** (British Museum of Natural History; London), **CAS** (California Academy of Sciences; San Francisco, California).

Quantitative Morphological

These features are explicitly defined and illustrated in Bond (2012).

ANTd	number of teeth on the anterior margin of the female cheliceral fang furrow
Cl, Cw	carapace length and width. Carapace length taken along the mid-line dorsal most posterior position to the anterior front edge of the carapace (chelicerae are not included in length). Carapace width taken at the widest point
LBl, LBw	labium length and width taken from the longest and widest points, respectively
PTl, PTw	male palpal tibia length and width
Bl	palpal bulb length from embolus tip to the bulb base, taken in the ventral plane at its longest point

PTLs, TBs	number of female prolateral patella and tibial spines leg III
STRI, STRw	sternum length and width. Sternum length from the base of the labium to its most posterior point. Width taken across the widest point, usually between legs II and III
TSrd, TSp, TSr	number of tibia I spines on the distal most retrolateral, prolateral, and midline retrolateral positions

Measurement, characterization, and illustration of morphological features

Unique voucher numbers were assigned to all specimens (alphanumeric designations beginning with EU, MY, or UMM); these data were added to each vial and can be used to cross-reference all images, measurements, and locality data. All measurements are given in millimeters and were made with a Leica M165c dissecting microscope equipped with the Leica Analysis Suite Software. Lengths of leg articles were taken from the mid – proximal point of articulation to the mid – distal point of the article (*sensu* Bond 2012, figures 11–16). Leg I and Leg IV article measurements are listed in the species descriptions in the following order: femur, patella, tibia, metatarsus, tarsus. Carapace and leg coloration are described semi-quantitatively using Munsell® Color Charts (Windsor, NY) and are given using the color name and color notation (hue value/chroma).

Mating clasper line drawings were first recorded as digital images and then traced as vector drawing objects using Adobe Illustrator (Adobe Systems Inc.). Digital images of specimens were made using a Visionary Digital Imaging System (Visionary Digital™, Richmond, VA) where images were recorded at multiple focal planes and then assembled into a single focused image using the computer program Helicon Focus (Helicon Soft, Ltd., Ukraine). The female genital region was removed from the abdominal wall and tissues dissolved using trypsin; spermathecae were examined and photographed in the manner described above. Following Bond (2012) and Bond and Taylor (2013) habitus illustrations were constructed from whole body images that were bisected, copied, and reflected in Adobe Photoshop (Adobe Systems, Inc.) to produce a roughly symmetrical image; the actual raw image on which the habitus illustration is based has been deposited in Morphbank and its record number noted in the figure legend (value in square [] brackets). Unless otherwise stated, scale bars = 1.0 mm.

Locality data and georeferencing

Latitude and longitude for all collecting localities were recorded in the field using a Garmin® Global Positioning System receiver (Garmin International Ltd., Olathe,

KS) using WGS84 map datum. For previously collected specimens (e.g., loaned museum specimens) locality data were georeferenced by hand by finding the approximate locality using Google Earth (WGS84 datum). A distribution map was constructed using ArcGIS using NAD83 map datum. Specimens without latitude and longitude data were georeferenced as described by Bond (2012). Precision for each georeferenced point is annotated as a superscript in each material examined section of the species' taxonomy using the confidence value scheme employed by Murphey et al. (2004): 1 = exact coordinates given; 2 = amended exact coordinates (i.e., exact coordinates given but were emended on validation); 3 = public land survey system; 4 = within 1km radius; 5 = within 5km radius; 6 = within 10km radius; 7 = to county or > 10km; 8 = to state; 9 = to project region. Latitude and longitude are recorded to the 4th decimal place as an indication of the precision in the point assigned by us (i.e., where we have assigned the locality place-holder for the specimen in question), not precision in the recording of the value or to specify the exact point of collection. Detailed locality and associated GIS data as supplemental data files in spreadsheet and KML file format can be downloaded online from the Dryad Data Repository at doi: 10.5061/dryad.6dc14.

Data resources

The data underpinning the analysis reported in this paper (see below) were deposited on 18 November 2013 in the Dryad Data Repository at doi: 10.5061/dryad.6dc14 and at GBIF, the Global Biodiversity Information Facility, http://ipt.pensoft.net/ipt/resource.do?r=eucteniza_data. Images associated with species descriptions have been deposited in Morphbank (<http://www.morphbank.net>); Morphbank image record numbers are noted in brackets by each figure in the figure legend.

Taxonomy

Family Euctenizidae Raven, 1985

Type genus. *Eucteniza* Ausserer, 1875

Subfamily Euctenizinae Raven, 1985

<http://zoobank.org/C27FB688-5D8E-4E77-ABCC-FD108DC4C22D>

Included genera. *Entychides* Simon, 1888; *Eucteniza* Ausserer, 1875; *Neoapachella* Bond & Opell, 2002; *Promyrmekiaphila* Schenkel, 1950.

Genus *Eucteniza* Ausserer, 1875

<http://zoobank.org/F1037BA5-A80D-47F9-8F15-6937D62F89E4>

<http://species-id.net/wiki/Eucteniza>

Figs 1–7

Eucteniza Ausserer, 1875: 149 (type species by monotypy *Eucteniza mexicana* juvenile holotype from Mexico, deposited in BMNH, examined). – E. Simon 1892: 110. – F.O.P.-Cambridge 1897: 12. – Bond and Opell 2002.

Flavila O.P.-Cambridge, 1895: 156 (type species by monotypy *Flavila relatus* O.P.-Cambridge, male holotype from Mexico, Amula in Guerrero, deposited in the BMNH, examined). – synonymized by F.O.P.-Cambridge 1897: 13.

Enrico O.P.-Cambridge, 1895: 157 (type species by monotypy *Enrico mexicanus* juvenile holotype from Mexico, Atoyac, Veracruz, deposited in BMNH, examined). – F.O.P.-Cambridge 1897: 12. – E. Simon 1903: 899. – synonymized by Bond and Opell 2002.

Astrosoga Chamberlin, 1940: 5 (type species by monotypy *Astrosoga rex* male holotype from Kingsville, Texas, deposited in AMNH, examined). – Chamberlin and Ivie 1945: 556. – synonymized by Bond and Opell 2002.

Diagnosis. *Eucteniza* males can be recognized by the presence of 1-2 mid-ventral megaspines on the tibia of both legs I and II (Figs 8–10). Such mating clasper spination configuration is similar to that of *Neoapachella* males for leg I but are absent on leg II. Females can be distinguished from all other euctenizid genera by having what appears to be a bi-dentate cheliceral furrow and a rastellum positioned on a moderate to high rastellar mound, whereas other genera have a single row of promarginal teeth and a small patch of denticles and lack a distinct rastellar mound. Additional *Eucteniza* autapomorphies include a patella IV spine patch and a weakly sclerotized posterior carapace margin.

General description. Small to large sized trapdoor spiders. Cephalothorax longer than wide, sloping posteriorly, lacking pubescence in most species (Fig. 2). Posterior third of carapace very lightly sclerotized (Figs 2, 23, 24). Thoracic groove intermediate to wide, procurved (Fig. 2) and deep. Eyes not on a tubercle (Fig. 3). AME, PME subequal diameter. Posterior eye row slightly recurved, anterior eye row slightly procurved (Fig. 2). Caput moderately high (Fig. 3). Carapace of ethanol preserved specimens appears most often reddish-brown, sometimes lighter. The coloration of living spiders tends to be a darker brown, however there is considerable variation in the intensity of coloration. Male coloration in most specimens is dark reddish-brown. Abdominal coloration light to dark brown, sometimes with dark mid dorsal blotch.

Sternum wider posteriorly, tapering anteriorly (Fig. 4). Posterior sigilla large and positioned mid-posteriorly nearly contiguous. Anterior margin of sigilla lacks rounded margin. Palpal endites longer than wide with numerous cuspules (Fig. 4). Labium wider than long, with numerous cuspules (Fig. 4). Chelicerae dark brown. Rastellum consists of numerous spines borne on a distinctive mound. Fangs of intermediate

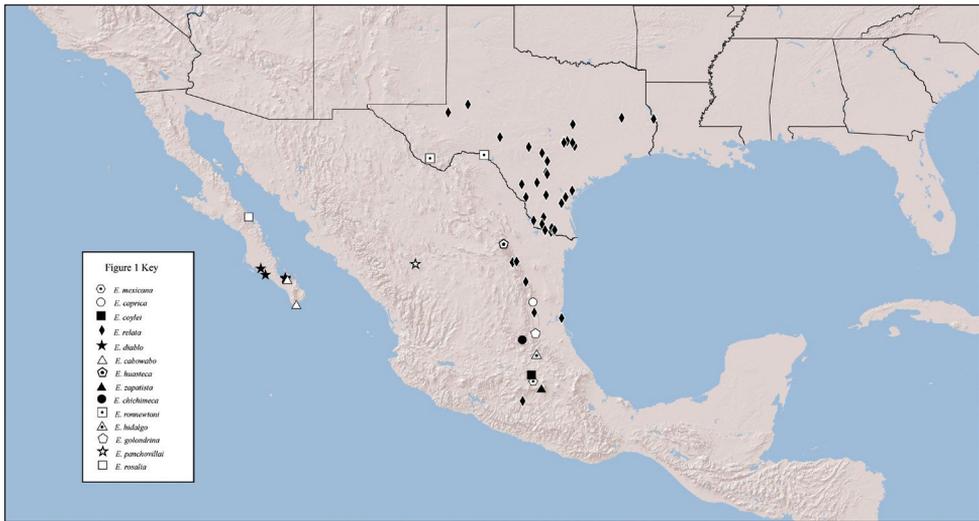


Figure 1. Distribution of known *Eucteniza* species.

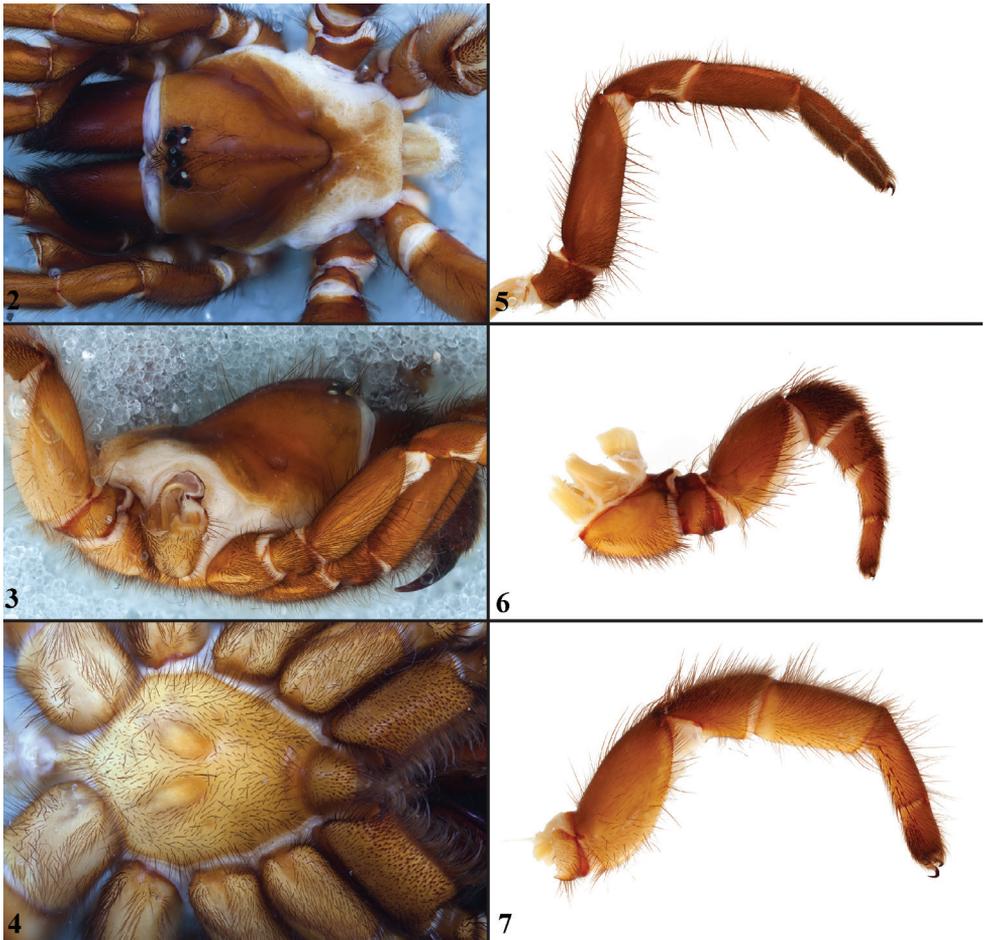
length and thickness. Cheliceral promargin with row of very large teeth; retromargin row comprises distinct row of large teeth interspersed with denticles.

Apical PLS article short, digitiform. Spinnerets mostly with pumpkiniform spigots with several articulated spigots interspersed on apical and median articles of PLS and the PMS (Bond and Opell 2002, fig. 3E). Two to three large, articulated spigots on apical most aspect of the PLS. PMS article robust. See Bond and Opell (2002) for more detailed descriptions of spigot types.

Anterior leg articles slender relative to posterior. Tarsi short and robust (Figs 5–6). Female scopulae long, dense, asymmetrical, extending full length of tarsus, metatarsus and half length of tibia on anterior legs; posterior legs lack distinct scopulae. Male tarsi I and II with short sparse scopulae that are restricted to the ventral surface. Basal palpal tooth and STC I – IV basal tooth elongate and bifid. STC IV with 5 or more teeth. Female anterior legs with very few ventral spines (Fig. 5). Prolateral surface of female patella III and IV covered in numerous thick short spines (Fig. 6). Preening comb on metatarsus IV absent; metatarsus, tarsus IV with ventral spines (Fig. 7). Tarsal trichobothria arranged in a wide band with interspersed setae. Spermathecae generally comprise a simple unbranched bulb that lacks an elongate base.

Male mating clasper morphology is distinctive. Tibia legs I & II swollen mid-ventrally in most species, bearing 1-2 large spines; prolateral aspect with a small to large patch of smaller, thickened, short spines. Metatarsus of leg I lacks excavation and spur. Palpal bulb simple, with spherical base, planar distally near origin of embolus. Palpal cymbium lacks dorsal spines (Fig. 11).

Distribution. Distributed primarily throughout central Mexico and Baja California (Fig. 1) with an extension northward into Texas (United States).



Figures 2–7. Standard light microscopy views of female *Eucteniza relata* (O.P.-Cambridge, 1895) from Hidalgo Co., TX. **2** dorsal view **3** side view **4** ventral view of sternum, labium and palpal endites **5** right leg I, retrolateral view **6** left leg III, prolateral view **7** left leg IV, prolateral view.

Key to males

Note: as discussed by Bond (2012) keys to many mygalomorph taxa are sometimes far from optimal and thus one should not rely too heavily on species determinations using this key. Instead, knowledge of where specimen was collected and comparison to description and illustrations will likely prove more useful.

- 1 Tarsus swollen mid-ventrally, width wider than metatarsus (Fig. 8).....
 *E. mexicana*

- Tarsus width subequal to metatarsus width..... 2
- 2 Tibia I swollen dorsally, behind tibia I metatarsus junction (Fig. 53).....
..... *E. chichimeca*
- Tibia I not swollen dorsally behind tibia I metatarsus junction 3
- 3 Ventral tibial megaspines borne on distinct apophysis (Fig. 31) 4
- Ventral tibial megaspines not borne on a distinct apophysis..... 5
- 4 Tarsus I with short dorsal spines, tarsus III curved (Figs 31, 35) *E. diablo*
- Tarsus I lacks short spines, palpal tibia retrolateral surface with extensive
spine patch (Figs 48, 51, 52)..... *E. zapatista*
- 5 Metatarsus I with ventral microspines and subdorsal row of spines on prolateral
surface tibia II (Figs 64, 66) *E. hidalgo*
- Metatarsus I lacking ventral microspines, and leg II prolateral spines on
tibia 6
- 6 Palpal tibia with row of retrolateral spines at distal edge and metatarsus I with
patch of distal ventral spines (Figs 69, 72, 73) *E. golondrina*
- Palpal tibia without row of retrolateral spines at distal edge; metatarsus lacks
distinct ventral spines (numerous) 7
- 7 Very small (Cl < 3.5mm); very pale in coloration *E. huasteca*
- Typically larger in size (Cl > 4.00mm); darker in color 8
- 8 Leg I metatarsus as long as or subequal in length to tibia; tibia slender with
thin ventral megaspines (Fig. 37) *E. cabowabo*
- Leg I tibia shorter than metatarsus, ventral megaspines typically thicker and
tibia not slender (usually swollen mid-ventrally) 9
- 9 Leg I prolateral tibial spines are longer in length 10
- Leg I prolateral tibial spines are shorter in length 11
- 10 Leg I prolateral tibial spines fewer (10), longer in length, and thinner; spider
paler in color (Fig. 14) *E. caprica*
- Leg I with more prolateral tibial spines (14) which are relatively shorter in
length and stouter (Fig. 19) *E. coylei*
- 11 Tibia I with very few prolateral spines (< 4) with few (1) spines situated distally
(Fig. 60) *E. ronnewtoni*
- Tibia I with larger number of prolateral spines (>3) with spines more evenly
distributed distally to proximally (Fig. 26) *E. relata*

Nomen dubium

Eucteniza atoyacensis Bond & Opell, 2002. Replacement name: *Enrico mexicanus* (O.P.-Cambridge, 1895) = *Eucteniza atoyacensis*. Holotype specimen is a juvenile and thus no known specimens or species can be unambiguously attributed to this name at this time.

***Eucteniza mexicana* Ausserer, 1875**

http://species-id.net/wiki/Eucteniza_mexicana

Figs 1, 8–12

Eucteniza mexicana Ausserer, 1875: 149; juvenile holotype from Mexico, deposited in BMNH, examined. – E. Simon 1892: 110. – F.O.P.-Cambridge 1897: 12. – Bond and Opell 2002.

Exemplar material. Male exemplar (EU008) from Mexico Distrito Federal, Mexico, 19.4327 -99.1347^s, elev. 2249m, coll. J. Honey, deposited in AMNH.

Diagnosis. *Eucteniza mexicana* is similar to *E. coylei* and *E. caprica* in appearance but has more stout tarsi on leg I (Figs 8–10, 12) and fewer prolateral leg I tibial spines that are short and thick; prolateral tibial spines on the other two species are longer and thinner.

Description of male exemplar. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Color faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/4. Abdomen very dark brown 7.5YR 2.5/3. *Cephalothorax.* Carapace 6.707 long, 5.548 wide, sparsely setose, pars cephalica slightly elevated. Fringe sparse. Foveal groove deep, procurved. Tubercle absent. AER slightly procurved. PER slightly recurved. AME slightly larger in diameter than PME. Sternum moderately setose, STRl 3.825, STRw 3.401. Posterior sternal sigilla very large, not contiguous, medial pair of anterior sigilla moderate in size and inset, anterior pair small and marginal. Chelicerae with anterior tooth row comprising 7 large teeth, posterior margin with single row of 9 small teeth. Palpal endites with numerous cuspules across endite face, labium with 7–9 cuspules, LBw 1.086, LBl 0.613. Rastellum consists of 7 small spines on a small mound. *Abdomen.* Moderately setose. *Legs.* Leg I: 6.087, 3.050, 4.303, 3.920, 2.572; leg IV: 6.341, 2.824, 4.771, 5.836, 3.508. Dense scopulae on legs I–II. Tarsus I with wide band of 14 trichobothria. Leg I spination pattern (Figs 8, 9, 12); TSp 8, TSr 0, TSrd 0; leg II with two ventral thin megaspines. *Pedipalp.* PTw 1.570, PTL 2.908, Bl 1.430. Embolus arises sharply from bulb and tapers quickly, geniculate at tip (Fig. 11).

Variation. Known only from the exemplar specimen and juvenile holotype

Distribution. Highly imprecise, Mexico; exemplar specimen from Mexico Distrito Federal (Fig. 1).

***Eucteniza caprica* sp. n.**

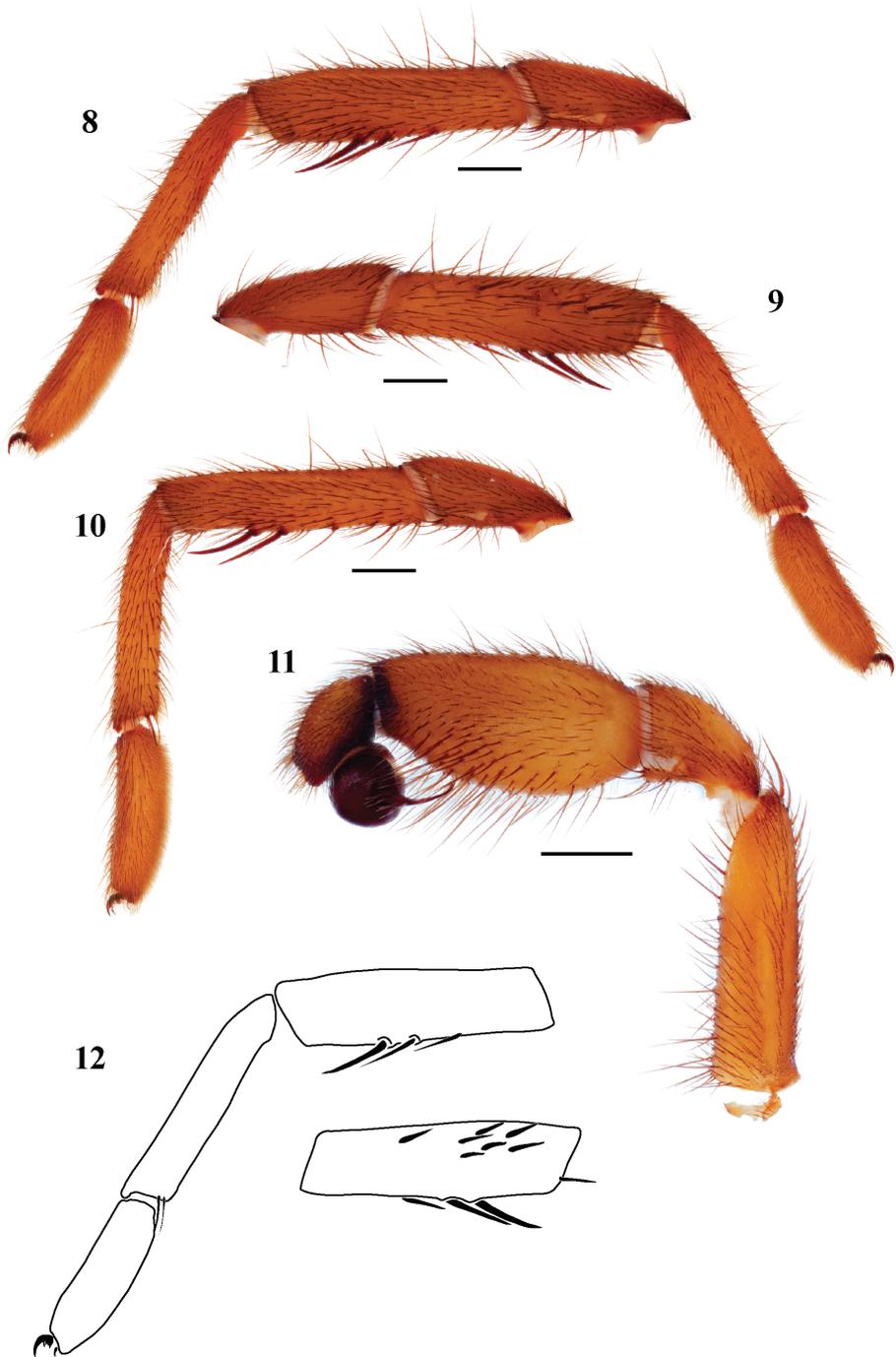
<http://zoobank.org/2664B285-A666-43EB-9735-62FF425E1026>

http://species-id.net/wiki/Eucteniza_caprica

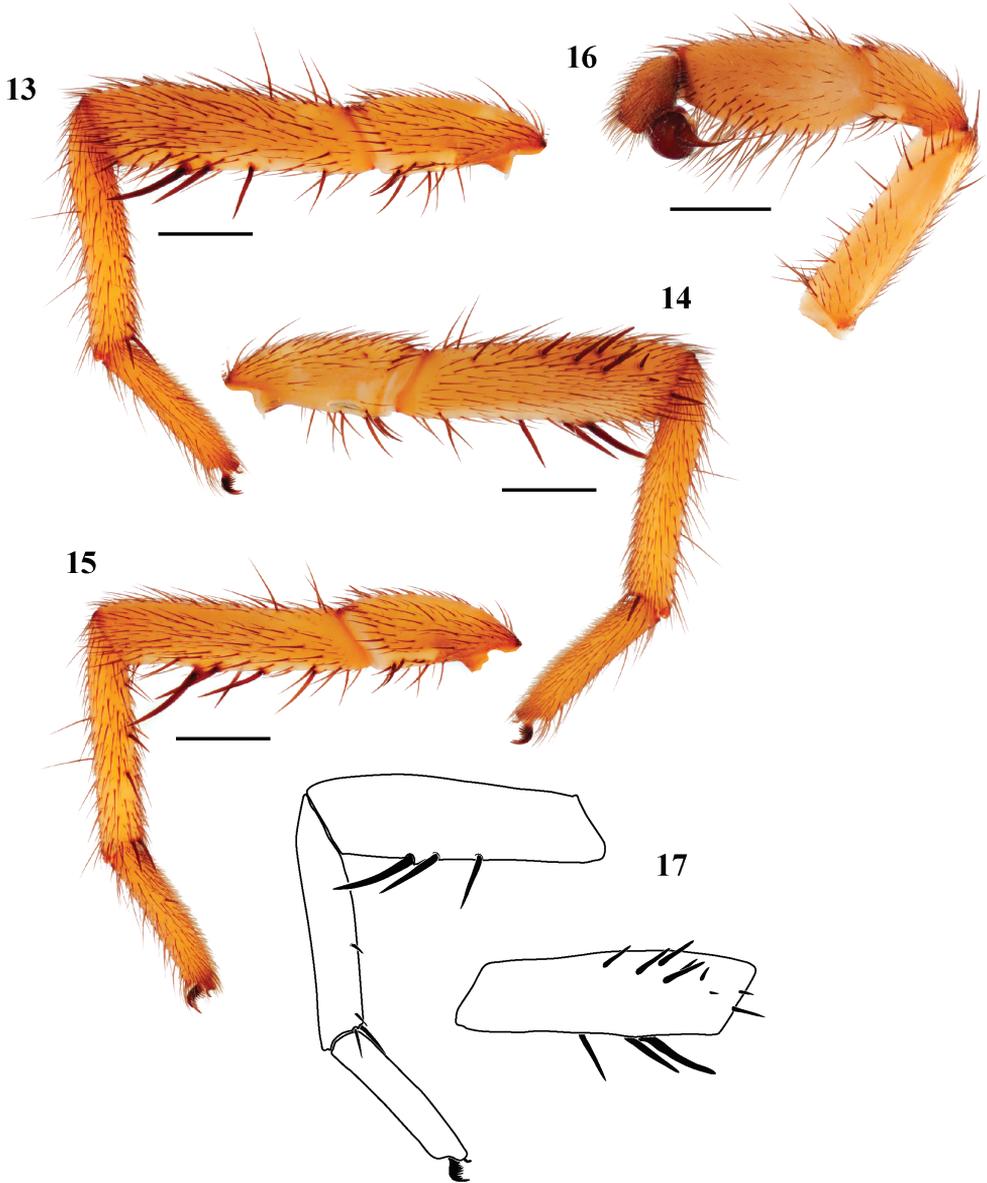
The “Caprica-Six Trapdoor Spider”

Figs 1, 13–17

Type material. Male holotype (EU106) from Tamaulipas, Mexico, 23.0303 -99.1478^s, elev. 335m, coll. G. Farias 13.iii.1972, deposited in AMNH.



Figures 8–12. *Eucteniza mexicana* Ausserer, 1875, male exemplar specimen from Mexico Distrito Federal, Mexico. **8** retrolateral aspect, leg I [831980] **9** prolateral aspect, leg I [831976] **10** retrolateral aspect, leg II [831982] **11** retrolateral aspect, pedipalp [831984] **12** line drawings, leg I retrolateral and prolateral (tibia) aspects.



Figures 13–17. *Eucteniza caprica* sp. n. male holotype specimen from Tamaulipas, Mexico. **13** retro-lateral aspect, leg I [832084] **14** pro-lateral aspect, leg I [832080] **15** retro-lateral aspect, leg II [832086] **16** retro-lateral aspect, pedipalp [832088] **17** line drawings, leg I retro-lateral and pro-lateral (tibia) aspects.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the humanoid cylon model Caprica 6, portrayed by Tricia Helfer in the remake of the science fiction series *Battlestar Galactica*.

Diagnosis. *Eucteniza caprica* is similar to *E. mexicana* in appearance but is smaller in size and lighter in coloration, leg I tarsi are not nearly as stout (Figs 13–15, 17).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Color faded. *General coloration.* Carapace strong brown 7.5YR 5/6. Abdomen light yellowish brown 10YR 6/4. *Cephalothorax.* Carapace 4.712 long, 4.041 wide, sparsely setose, pars cephalica slightly elevated. Fringe sparse with 2-3 heavy setae at posterior corners. Foveal groove deep, procurved. Tubercle absent. AER slightly procurved. PER slightly recurved. AME slightly larger in diameter than PME. Sternum moderately setose, STRl 2.615, STRw 2.301. Posterior sternal sigilla very large, elongate, not contiguous, anterior sigilla pair not visible. Chelicerae with anterior tooth row comprising 6 large teeth, posterior margin with single row of 3 small teeth. Palpal endites lacking cuspules across endite face, labium lacking cuspules, LBw 0.892, LBl 0.548. Rastellum consists of 5 small spines not on a mound. *Abdomen.* Moderately setose. *Legs.* Leg I: 4.583, 2.141, 2.930, 2.872, 1.862; leg IV: 5.227, 2.113, 4.124, 4.557, 2.763. Light scopulae on legs I-II. Tarsus I with wide band of 15 trichobothria. Leg I spination pattern (Figs 13, 14, 17); TSp 10, TSr 0, TSrd 0. *Pedipalp.* PTw 0.985, PTl 1.942, Bl 0.932. Embolus arises sharply from bulb and tapers quickly, slightly flared at tip (Fig. 16).

Variation. Known only from the male holotype specimen.

Distribution. Known only from the type locality, Tamaulipas, Mexico (Fig. 1).

***Eucteniza coylei* sp. n.**

<http://zoobank.org/F183B402-2346-4296-8DFD-6D1324216110>

http://species-id.net/wiki/Eucteniza_coylei

'Coyle's Trapdoor Spider'

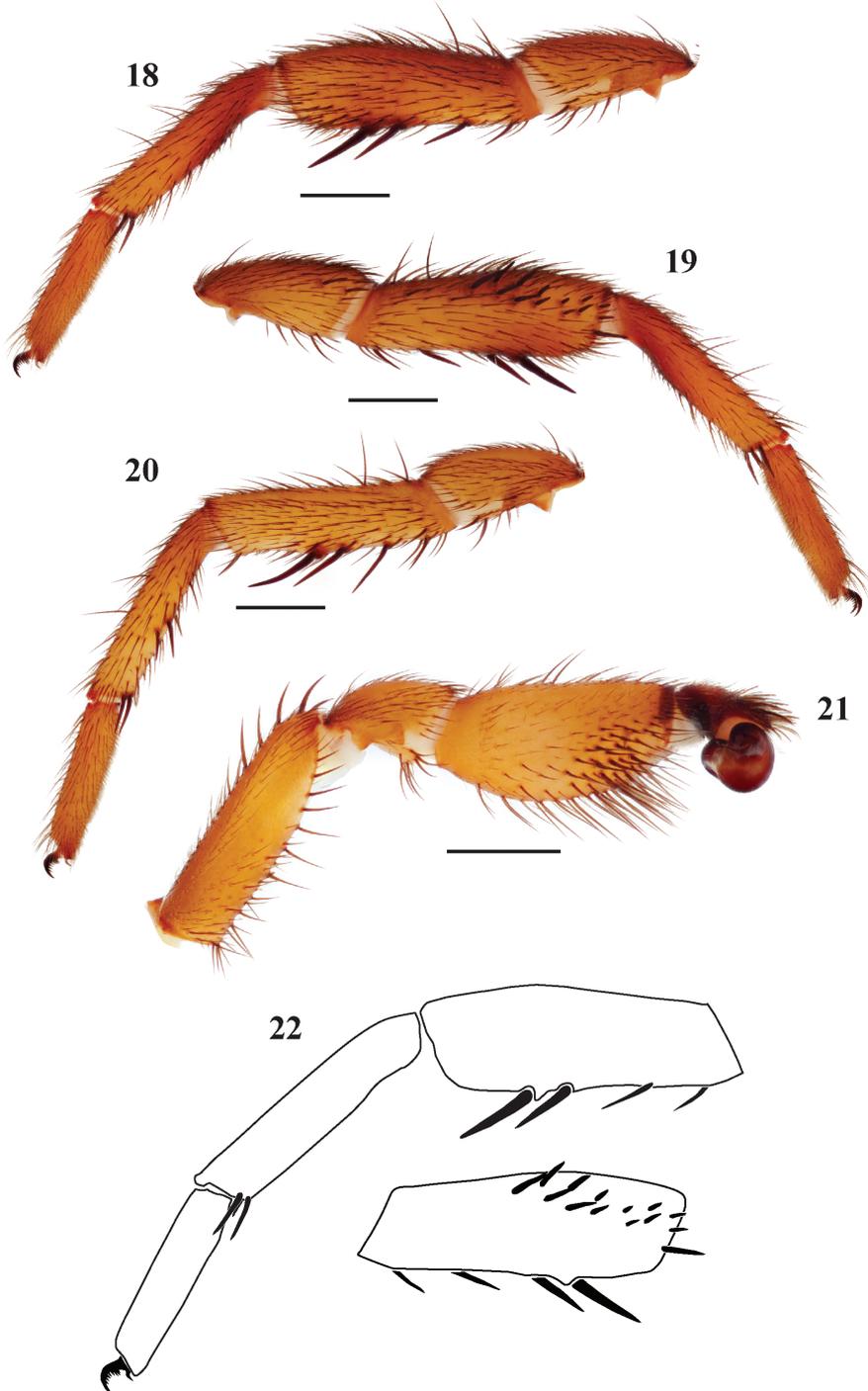
Figs 1, 18–22

Type material. Male holotype (EU009), from Morelos, Mexico, 0.8km W Tepozitlán, Rt 1150 on rd to Ocotepc, 18.9889 -99.1116⁸, 1822m, coll. F. Coyle 10.vi.1982. Male holotype deposited in AMNH.

Etymology. The specific epithet is a patronym in honor of arachnologist Fred Coyle who collected the type specimen.

Diagnosis. *Eucteniza* is similar in appearance to *E. mexicana* but has thinner tarsi and short tibia I (Figs 19, 22) prolateral spines that are concentrated distally whereas *E. mexicana* lacks short distal spines on tibia I.

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed and stored in vial with specimen. Color faded. *General coloration.* Carapace dark red 2.5YR 3/6. Abdomen reddish black 2.5YR 2.5/1. *Cephalothorax.* Carapace 4.75 long, 4.00 wide, glabrous, pars cephalica moderately elevated. Fringe of sparse black setae. Foveal groove deep, procurved. AER slightly procurved, PER straight. AME and PME subequal. Sternum moderately setose, STRl 2.83, STRw 2.76. Posterior sternal sigilla large, not contiguous, anterior sigilla pairs small and marginal. Chelicerae with anterior row comprising 6 large teeth, posterior margin with a patch of approximately 12 small teeth. Palpal endites and la-



Figures 18–22. *Eucteniza coylei* sp. n. male holotype specimen from Morelos, Mexico. **18** retrolateral aspect, leg I [831990] **19** prolateral aspect, leg I [831986] **20** retrolateral aspect, leg II [831992] **21** retrolateral aspect, pedipalp [831994] **22** line drawings, leg I retrolateral and prolateral (tibia) aspects.

bium without cuspules, LBw 0.79, LBl 0.58. Rastellum consists of 8 spines. *Abdomen.* Setose, thin, fine black setae. *Legs.* Leg I 4.20, 2.20, 2.88, 2.56, 1.84; leg IV: 4.30, 2.00, 3.75, 3.80, 2.25. Light scopulae on legs I, II. Tarsus I with 10 widely spaced trichobothria. Leg I spination pattern (Figs 19, 20, 22); TSp 14, TSr 0, TSrd 0. *Pedipalp.* PTw 1.58, PTL 2.00, Bl 1.45. Embolus relatively short, flared at tip (Fig. 21).

Variation. Known only from the type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known from the type locality in Morelos, Mexico (Fig. 1).

***Eucteniza relata* (O.P.-Cambridge, 1895)**

http://species-id.net/wiki/Eucteniza_relata

'The Southwestern Trapdoor Spider'

Figs 1, 23–30

Flavila relatus O.P.-Cambridge, 1895: 156; male holotype from Mexico, Amula in Guerrero, deposited in the BMNH, examined in 2002. – F.O.P.-Cambridge 1897: 13.

Eucteniza rex (Chamberlin, 1940): 5; male holotype from Kingsville, Texas, deposited in AMNH, examined. – Chamberlin and Ivie 1945: 556. – Bond and Opell 2002.

syn. n.

Eucteniza stolidi (Gertsch & Mulaik, 1940): 310; female holotype from Austin, Texas, deposited in AMNH, examined. – Bond and Opell 2002. **syn. n.**

Diagnosis. *Eucteniza relata* mating clasper morphology comprises 2 large, tightly grouped megaspines on the mid-ventral aspect of tibia I; few (4) to many prolateral distal spines (21); tibia I medially swollen (Figs 25, 26, 29).

Description. *Eucteniza relata* described by O.P.-Cambridge (1895). Synonyms (*E. rex* and *E. stolidi*) described by Chamberlin (1940), Gertsch and Mulaik 1940, and Bond and Opell (2002). The holotype for *Eucteniza rex* was illustrated by Bond and Opell (2002).

Variation (males, 6). Cl 8.07-11.53, 9.59±0.47; Cw 7.26-9.76, 8.28±0.37; STRl 4.73-5.98, 5.3±0.19; STRw 4.34-6.01, 5.06±0.26; LBw 1.18-1.56, 1.4±0.06; LBl 0.78-1.14, 0.98±0.05; leg I: 7.39-9.3, 8.24±0.28; 3.86-5.09, 4.44±0.18; 5.04-6.38, 5.41±0.22; 5.55-7.23, 6.38±0.26; 2.78-3.99, 3.34±0.18; leg IV: 7.74-9.88, 8.58±0.32; 3.98-5.15, 4.41±0.16; 5.98-7.93, 6.67±0.3; 6.47-9.02, 7.62±0.36; 3.64-5.31, 4.49±0.27; PTL 4.19-5.31, 4.64±0.16; PTw 1.87-2.25, 2.06±0.05; Bl 1.54-2.45, 1.89±0.13; TSp 4-21, 9.33±2.54; TSr 0-0, 0±0; TSrd 0-0, 0±0;

Variation (females, 6). Cl 7.55-10.01, 8.61±0.45; Cw 6.39-7.94, 7.31±0.31; STRl 4.4-5.89, 4.98±0.27; STRw 4.13-5.23, 4.68±0.21; LBw 1.39-1.98, 1.62±0.11; LBl 0.96-1.39, 1.16±0.08; Leg I: 13.54-20.45, 17.11±1.23; ANTd 6-8, 7.2±0.37; PTLs 45-80, 63.6±7.02; TBs 16-36, 23.8±3.29.

Material examined. **Mexico: Guerrero:** Taxco, 18.5351 -99.6098⁶, 1621m, V Roth, W Gertsch 29.vii.1956 [EU030, 1♂, AMNH]; **Nuevo Leon:** Cerro Potosi,

23



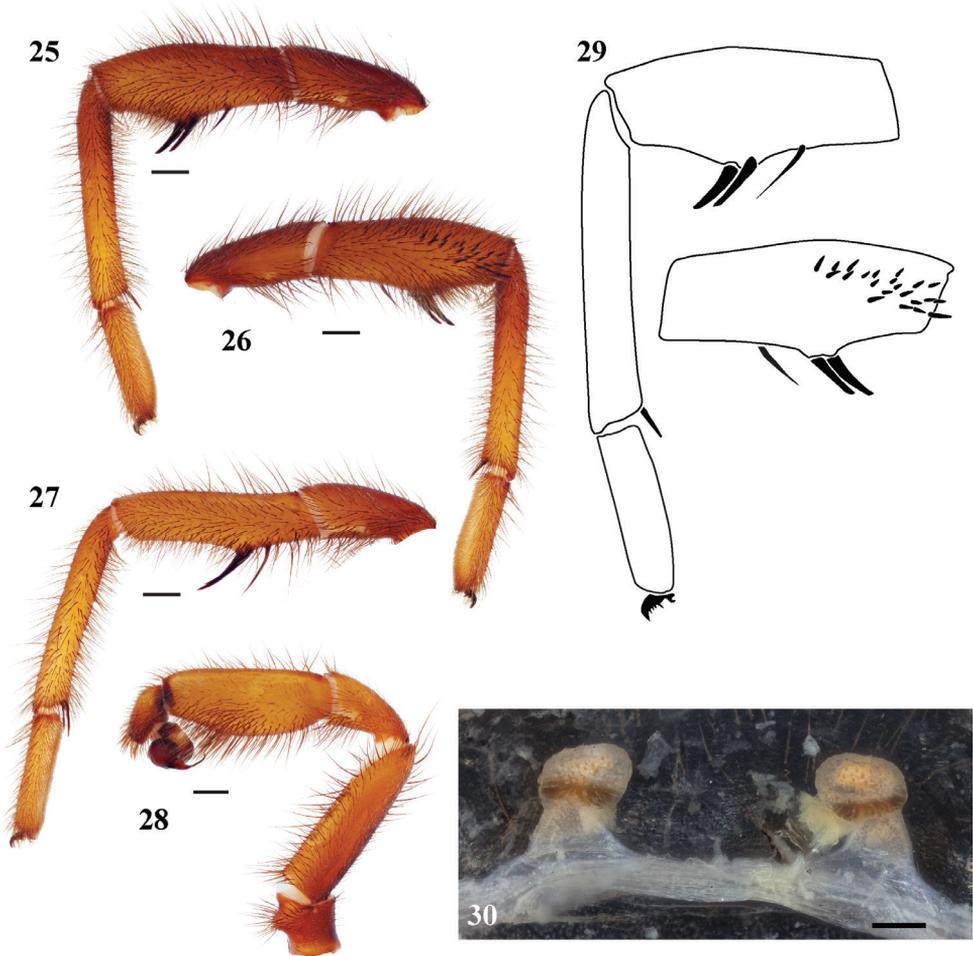
24



Figures 23, 24. *Eucteniza relata* (O.P.-Cambridge, 1895) from Kingsville, Texas **23** female habitus illustration [832092] **24** male habitus illustration [832056].

Galeana, 24.8811 -100.2327⁵, 3713m, S & J Peck 26.vi.1969 [EU061, 1♀, AMNH]; 20mi W of Linares, 24.8666 -99.8848⁶, 1894m, S Mulaik 1.ix.1956 [EU074, 2♀, AMNH]; **Tamaulipas:** Conrado Castillo, 23.9500 -99.4667⁶, 1955m, P Sprouse v.1980 [EU003, 1♀, AMNH]; Antiguo Morelos, Mexico, 22.5500 -99.0833⁵, 205m, JA Beatty 21.vi.1963 [EU036, 1♂, AMNH]; Tampico, Mexico, 22.3000 -97.8500⁵,

10m, Ekhomb 1942 [EU013, 1♀, AMNH]. **United States: Texas: Atascosa Co.:** 28.8333 -98.5000⁷, 106m, C Rutherford 31.xii.1936 [EU062, 1♀, AMNH]; Jourdanton, 28.9178 -98.5461³, 140m, C Rutherford [EU046, 1♀, AMNH]; Jourdanton, 28.9178 -98.5461³, 140m, C Rutherford 27.xi.1935 [EU058, 1♀, AMNH]; **Bastrop Co.:** Bastrop State Park, 30.1122 -97.2606³, 168m, B Hunsacker 26.iii.1958 [EU029, 1♀, AMNH]; Little Sandy Creek 10mi NW of Bastrop, 30.2601 -97.3555³, 125m, B Vogel 4.x.1971 [EU064, 1♂, AMNH]; **Bell Co.:** Temple, 31.0981 -97.3427⁶, 221m, M Hatley x.2006 [EU084, 1♂, TAMU]; **Bexar Co.:** San Antonio, 29.4239 -98.4933⁷, 198m, L Griffith 15.xii.1939 [EU049, 1♂, AMNH]; San Antonio, 29.424 -98.4833⁶, 199m, L Gonzales 10.xii.1987 [EU088, 1♂, TAMU]; San Antonio, 29.424 -98.4833⁶, 199m, L Monney 20.x.1989 [EU089, 1♂, TAMU]; San Antonio, 29.424 -98.4833⁶, 199m, R Uasquez 15.xi.1992 [EU090, 1♂, TAMU]; **Dimmit Co.:** 3mi NW of Catarina, 28.3747 -99.0107¹, 166, BE Hendrixson, M Capes, M Roberts 12.iii.2000 [EU092, 1♀, AUMNH]; **Duval Co.:** 4mi E of Freer, 27.8828 -98.5494⁵, 186m, EG Riley 11.x.2003 [EU085, 1♂, TAMU]; **Hidalgo Co.:** Mission, 26.2156 -98.325³, 43m [EU007, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik [EU026, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik [EU033, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 1.iii.1936 [EU027, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 1.v.1937 [EU048, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 27.ii.1939 [EU050, 1♀, 1 juv, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 1.iii.1938 [EU032, 2 juv, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, D Mulaik 5.vi.1939 [EU039, 1♂, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, 24.xii.1949 [EU040, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 15.iv.1936 [EU042, 1♀, AMNH]; Edinburg, 26.3014 -98.1631³, 29m, S Mulaik 31.xii.1934 [EU044, 069, 2♀, AMNH]; **Houston Co.:** Old Tyler Rd near Ratcliff, 31.3914 -95.1394⁶, 122m, SFA Student 23.ix.1968 [EU022, 1♀, AMNH]; **Kendall Co.:** Boerne, 39.7945 -98.7319⁶, 429m, ND Masters 20.ix.1994 [EU086, 1♀, TAMU]; **Kennedy Co.:** 50mi NW of Edinburg, 26.8796 -98.6642⁷, 154m, 24.ii.1949 [EU023, 1♀, AMNH]; **Kerr Co.:** Raven Ranch, 30.0666 -99.3333⁷, 546m, J McHenry 27.vi.1941 [EU053, 1♀, AMNH]; **Kleberg Co.:** Kingsville, 27.5156 -97.8558⁶, 18m, [EU063, 1♂, AMNH, EU037, 1♂, AMNH]; Kingsville, 27.5156 -97.8558⁶, 18m, JC Cross 31.xii.1944 [EU065, 1♂, AMNH]; Kingsville, 27.5156 -97.8558⁶, 18m, JC Cross 1.xi.1947 [EU066, 1♂, AMNH]; **LaSalle Co.:** 9mi W of Fowlerton on Hwy 97, 28.4534 -98.9598⁴, 110m, EG Riley 11.x.2003 [EU099, 1♂, AUMNH]; **Midland Co.:** Midland, 31.9973 -102.0779⁶, 848m, M Dille Summer 2002 [EU082, 1♂, AUMNH]; **Nueces Co.:** Robstown, 27.7900 -97.6686⁶, 21m, 14.x.1968 [EU035, 1♂, AMNH]; Robstown, 27.7900 -97.6686⁶, 21m, Richard 10.ix.1968 [EU055, 1♂, AMNH]; **Sabine Co.:** 9mi E of Hemphill, "Beech Bottom", 31.3405 -93.6948⁵, 58m, Anderson, Morris 15.xi.1985 [EU087, 1♀, 2♂, TAMU]; **San Patricio Co.:** 8mi NE of Sinton, 28.087 -97.3741⁵, 10m, HE Laughlin 15.x.1959 [EU019, 1♂, AMNH]; **Starr Co.:** 26.5666 -98.7333⁷, 135m, V Wilder 25.ix.1940 [EU043, 1♀, AMNH]; Near Hwy 83, 2.5mi W of Sullivan City, 26.2894 -98.5938⁴, 58m, WR Icenogle 6.ix.1974 [EU067, 1♂,



Figures 25–30. *Eucteniza relata* (O.P.-Cambridge, 1895) from Kingsville, Texas **25–29** male specimen **25** retrolateral aspect, leg I [832050] **26** prolateral aspect, leg I [832046] **27** retrolateral aspect, leg II [832052] **28** retrolateral aspect, pedipalp [832054] **29** line drawings, leg I retrolateral and prolateral (tibia) aspects **30** cleared spermathecae, scale bar = 0.1mm [832096].

AUMNH]; **Sutton Co.:** 30.5166 -100.6333⁷, 647m, L Pierce 17.ii.1973 [EU005, 1♂, AMNH]; **Travis Co.:** SRD University of Texas Campus, 30.2918 -97.7385³, 168m, WH McAlister 10.ii.1956 [EU006, 1♀, AMNH]; 5mi E of Austin, 30.3392 -97.5926⁶, 183m, WF Blair 21.i.1957 [EU020, 1♂, AMNH]; Austin, 30.2669 -97.7428³, 153m, 1.iii.2005 [EU034, 1♀, AMNH]; Austin, 30.2669 -97.7428³, 153m, Casteel 3.xii.1945 [EU041, 1♂, AMNH]; Austin, 30.2669 -97.7428³, 153m, 29.xi.1945 [EU054, 1♀, AMNH]; Austin, 30.2669 -97.7428³, 153m, 31.xii.1971 [EU070, 1♀, 2♂, AMNH]; Austin Caverns, 30.2969 -97.7743⁶, 152m, B Russel 3.x.1964 [EU072, 1♂, AMNH]; Austin, 30.2669 -97.7428³, 153m, 31.xii.2003 [EU076 Paratype, 1♀, AMNH]; Austin, 30.2671 Austin, 30.2671⁶, 148m, J Heskett

xii.2003 [EU083, 1♂, TAMU]; Austin, 30.2671 Austin, 30.2671⁶, 148m, 1.vii.1983 [UMM460, 1♂, AMNH]; **Ward Co.:** 5mi N of Monahans, 31.6352 -102.9727⁵, 808m, J Brown 7.xi.1993 [EU051, 1♂, AMNH]; **Webb Co.:** Near Hwy 83, 1.8mi N of jct w/Hwy 35, 27.7889 -99.4557¹, 213m, JE Bond 7.viii.1997 [EU107, 1♀, AUMNH]; Near Hwy 83, 1.8mi N of jct w/Hwy 35, 27.7889 -99.4557¹, 213m, JE Bond 7.viii.1997 [EU057, 077, 078, 079, 4♀, AMNH]; Near Hwy 83, 1.8mi N of jct w/Hwy 35, 27.7889 -99.4557¹, 213m, WR Icenogle 8.ix.1974 [EU016, 1♀, AUMNH]; Near Hwy 83, 1.8mi N of jct w/Hwy 35, 27.7889 -99.4557¹, 213m, WR Icenogle 8.ix.1974 [EU059, 1♀, AUMNH]; **Zapata Co.:** 35mi NW of Rio Grande City on Rt 83, 26.7299 -99.1124³, 350m, S Mulaik [EU045, 1♀, 2 juv, AMNH].

Distribution. Widely distributed throughout Texas and northern/central Mexico (Fig. 1).

Remarks. Without doubt this species, as circumscribed herein, represents multiple species, likely cryptic. Until additional data are available (e.g., molecules) we have chosen to be conservative and strictly apply a morphological species concept as described above.

***Eucteniza diablo* sp. n.**

<http://zoobank.org/C250C475-64A2-4568-A2ED-C97F9DF8E9E6>

http://species-id.net/wiki/Eucteniza_diablo

‘The Baja California Trapdoor Spider’

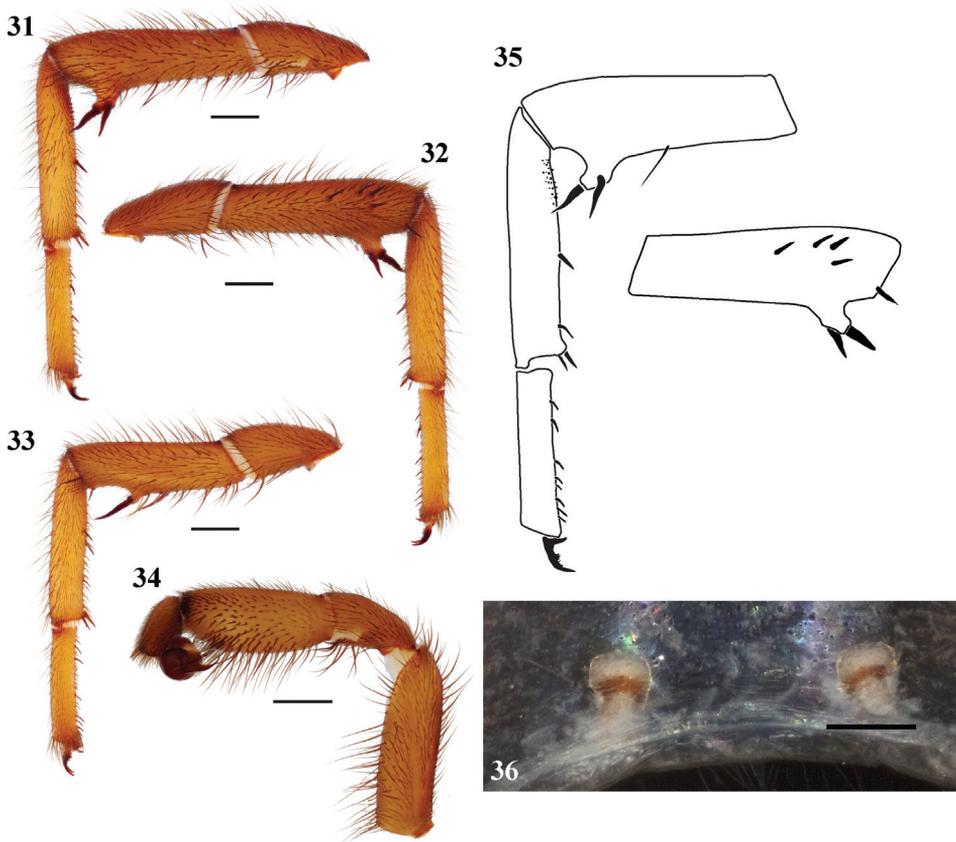
Figs 1, 31–36

Type material. Male holotype (EU081), from Mexico, Baja California Sur, 3.2km S of La Paz, 24.103 -110.307⁵, 58m 10.viii.1966; additional male paratypes (EU095) from Baja California Sur, Mexico, El Sombrero Trailer Park in La Paz, 24.1331 -110.2998⁵, 47m 3.vii.1968, coll. M. Bentzien; additional female paratype (EU102) from Mexico, Baja California Sur, 2mi S of Santa Rita, 24.572 -111.4364⁴, 36m 16.xi.1968, coll. E.L. Sleeper and F.J. Moore. Male holotype and male and female paratypes deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the highest peak on the Baja Peninsula, “Picacho del Diablo”.

Diagnosis. Male *Eucteniza diablo* specimens can be differentiated from all other species in the genus by having, in combination, leg I tibia megaspines borne on a mid-ventral apophysis, small microspines on the ventral distal aspect of metatarsus, short ventral spines on tarsus I, and a curved tarsus III (Figs 31, 32, 35). Similar to *E. zapatista* but lacking retrolateral spines on male palpal tibia (Fig. 34).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 80% EtOH. Multiple legs removed, stored in vial with specimen. Coloration faded. *General coloration.* Carapace dark reddish brown 2.5YR 3/4. Abdomen yellowish red 5YR 4/6. *Cephalothorax.* Carapace 6.31 long, 5.15 wide, glabrous, no distinct fringe, pars cephalica moderately elevated. Foveal groove strongly procurved, deep and shelf-like. Eyes without tubercle. AER slightly procurved, PER straight. AME, PME



Figures 31–36. *Eucteniza diablo* sp. n. from Mexico, Baja California Sur male holotype and female paratype **31–35** male specimen **31** retrolateral aspect, leg I [832074] **32** prolateral aspect, leg I [832070] **33** prolateral aspect, right leg II [832076] **34** retrolateral aspect, pedipalp [832078] **35** line drawings, leg I retrolateral and prolateral (tibia) aspects **36** cleared spermathecae, scale bar = 0.1mm [832098].

subequal, AME slightly smaller and PLE reduced in size, very small. Sternum with light setae, STRl 3.56, STRw 3.12. Posterior sternal sigilla in center, not contiguous, irregular shape, medial anterior sigilla pair inset, anterior pair marginal. Chelicerae with anterior tooth row comprising 5 large teeth, posterior margin with single row of 7 teeth. Palpal endites with cuspules distributed across entire face, labium with 14 cuspules, LBw 1.12, LBl 0.81. Rastellum consists of 8 spines. *Abdomen.* Moderate to dense setation. *Legs.* Leg I: 5.65, 2.50, 4.10, 3.95, 2.70; leg IV: 5.75, 2.50, 4.75, 5.00, 3.05. Very light scopulae on legs I, II. Tarsus leg III slightly curved, microspines on metatarsus proximal to junction with tibia; small spines on tarsus I ventral surface (Figs 31, 32, 35); TSp 4, TSr 0, TSrd 0. *Pedipalp.* PTw 1.28, PTl 2.50, Bl 1.31 (Fig. 34).

Variation. Known only from the type specimens.

Description of female paratype. *Specimen preparation and condition.* Specimen preserved in same manner as male holotype. *Color.* Carapace dark red 2.5YR 3/6.

Spinnerets light yellow. *Cephalothorax*. Carapace 6.3 long, 5.9 wide, glabrous. Lacks fringe. Foveal groove deep and procurved. Tubercle absent. AER very slightly procurved, PER straight. AME, PME subequal. Sternum moderately setose, STRI 4.40, STRw 3.65. Posterior sigilla large and nearly contiguous, medial anterior sigilla relatively large and positioned more towards center. Chelicerae anterior tooth row armed with 6 teeth with posterior margin comprising 4 teeth. Palpal cuspules numerous and widespread across endites; labium with 12 cuspules, LBw 1.14, LBl 0.88. Rastellum consists of 10 spines positioned on a mound. *Walking legs*. Leg I 14.43 long. Tarsus I with 12 widely scattered trichobothria. Legs I, II with heavy, asymmetric scopulae. PTLs 32, TBs 15. Preening combs absent. Spermathecae simple bulb (Fig. 36).

Additional material examined. Mexico: Baja California Sur: 27.3mi S Santa Rita, 24.2548 -111.2376⁵, 29m, SC Williams, J Bigelow, M Bentzien 27.vii.1968 [EU097, 1♂, AMNH]; La Paz city limits, 24.1331 -110.2998⁵, 8m, SC Williams, MA Cazier, M Bentzian, WK Fox, J Bigelow 13.vii.1968 [EU094, 1♂, AMNH].

Distribution. Known from the La Paz municipality of Baja California Sur, Mexico (Fig. 1).

***Eucteniza cabowabo* sp. n.**

<http://zoobank.org/CE5B7237-6056-4899-BA7B-67CC0AE7F4AB>

http://species-id.net/wiki/Eucteniza_cabowabo

‘The Cabo Wabo Trapdoor Spider’

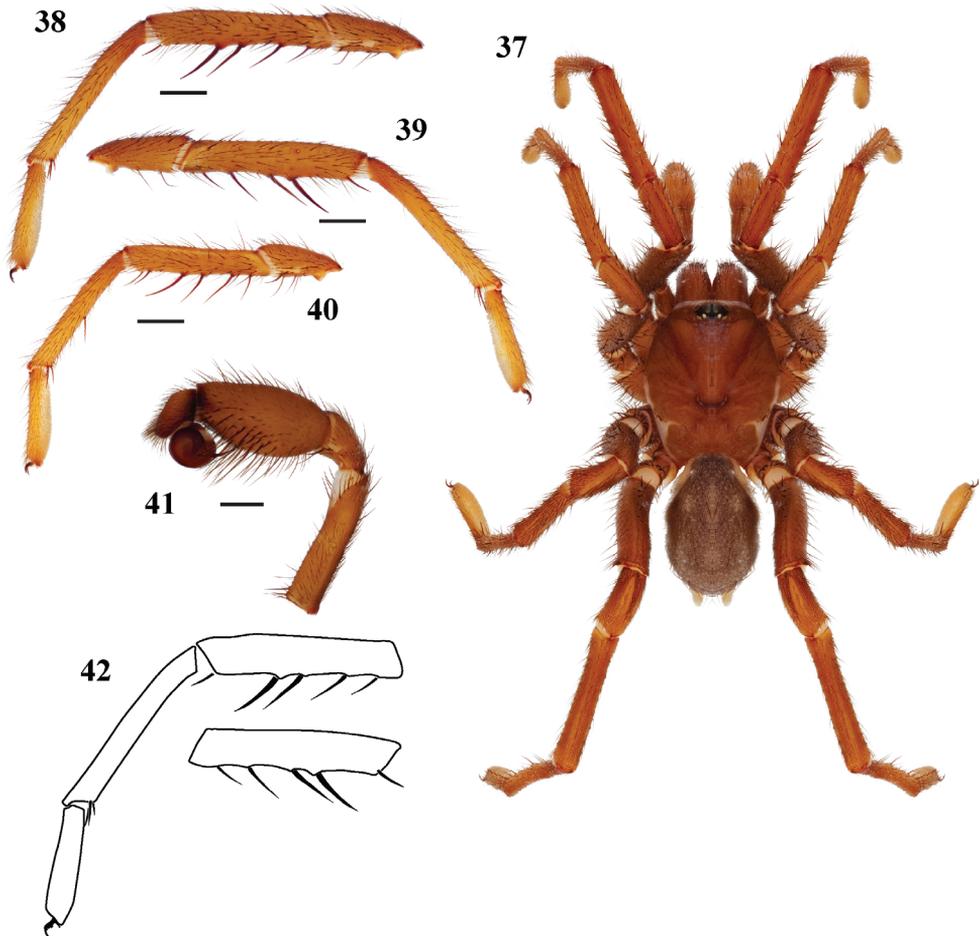
Figs 1, 37–42

Type material. Male holotype and female paratype (EU096), from Baja California Sur, Mexico, 8mi SE of La Paz, 24.0338 -110.2331⁴, 287m, coll. E. L. Sleeper, F. J. Moore 13.x.1968. Male holotype and female paratype deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition inspired by Sammy Hagar’s club and restaurant, Cabo Wabo, in Cabo San Lucas.

Diagnosis. Male *Eucteniza cabowabo* specimens differ from all other *Eucteniza* specimens by having a very slender leg I tibia and metatarsus with thin ventral megaspines (Figs. 3–40, 42); PME’s reduced in size. The single *E. cabowabo* female paratype lacks PME’s; due to the lack of specimens it is not clear whether this is a diagnostic feature or the specimen is aberrant.

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, leg I, and leg II left side removed, stored in vial with specimen. Coloration faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/4 (Fig. 37). Abdomen very dusky red 2.5YR 2.5/2. *Cephalothorax.* Carapace 5.25 long, 4.19 wide, glabrous, lacks fringe, pars cephalica low. Foveal groove deep and procurved. Tubercle absent. AER slightly procurved, PER slightly recurved. AME slightly larger in diameter than PME. Sternum moderately setose, STRI 3.04, STRw 2.48. Posterior sternal sigilla large, irregularly shaped, and contiguous, medial pair anterior sigilla more centrally positioned, irregularly shaped. Chelicerae with ante-



Figures 37–42. *Eucteniza cabowabo* sp. n. from Mexico, Baja California Sur male holotype **37** habitus [832094] **38** retrolateral aspect, leg I [832064] **39** prolateral aspect, leg I [832060] **40** retrolateral aspect, leg II [832066] **41** retrolateral aspect, pedipalp [832068] **42** line drawings, leg I retrolateral and prolateral (tibia) aspects.

rior tooth row comprising 6 teeth, posterior margin with single straight row of 4 teeth. Lacks palpal and labium cuspules, LBw 0.83, LBl 0.45. Rastellum consists of 8 spines. *Abdomen.* Moderately setose. *Legs.* Leg I: 5.44, 2.38, 3.88, 4.19, 2.31; leg IV: 5.69, 2.38, 4.69, 4.75, 3.19. Light scopulae on legs I, II, III, IV. Tarsus with 10 trichobothria, widely spread. Leg I spination; TSp 3, TSr 0, TSrd 0 (Figs 38, 39, 42). *Pedipalp.* PTw 1.36, PTL 2.60, Bl 1.35 (Fig. 41).

Variation. Known only from the type specimens and one other male.

Description of female paratype. *Specimen preparation and condition.* Specimen preserved in same manner as male holotype. *Color.* Carapace dark red 2.5YR 3/6. Spinnerets light yellow. *Cephalothorax.* Carapace 7.0 long, 4.81 wide, glabrous. Lacks fringe. Foveal groove deep and procurved. Tubercle absent. AER very slightly procurved, PER straight. PME absent. Sternum moderately setose, STRl 4.60, STRw

3.20. Posterior sigilla large and nearly contiguous, medial anterior sigilla relatively large and positioned more towards center. Chelicerae anterior tooth row armed with 6 teeth with posterior margin comprising 4 teeth. Palpal cuspules numerous and wide-spread across endites; labium with 12 cuspules, LBw 1.26, LBl 0.77. Rastellum consists of 14 spines positioned on a mound. *Walking legs*. Leg I 12.40 long. Tarsus I with 12 widely scattered trichobothria. Legs I, II with heavy, asymmetric scopulae. PTLs 25, TBs 16. Preening combs absent. Spermathecae not with specimen, presumed lost.

Variation. Known only from the female paratype specimen.

Additional material examined. Mexico: Baja California Sur: 6mi E of Cabo San Lucas, 22.9248 -109.8187⁴, 12m, H Ridgeway 13.i.1974 [EU093, 1♂, AMNH].

Distribution. Known from La Paz and Los Cabos municipalities of Baja California Sur, Mexico (Fig. 1).

***Eucteniza huasteca* sp. n.**

<http://zoobank.org/2E8ECBC1-E7D7-469C-AEE1-975C8BD0520E>

http://species-id.net/wiki/Eucteniza_huasteca

'The Huasteca Canyon Trapdoor Spider'

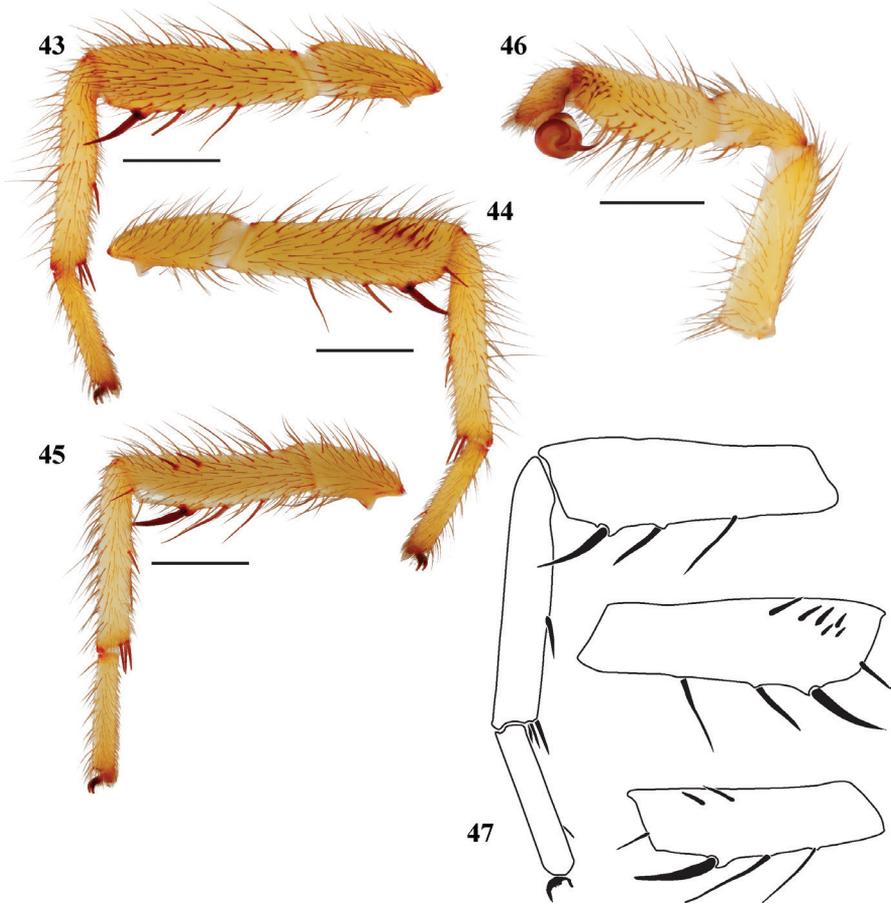
Figs 1, 43–47

Type material. Male holotype (EU052), from Nuevo Leon, Mexico, at La Huasteca Canyon, 3mi SW of Santa Catarina, 25.6544 -100.5075⁴, 1114m, coll. L. Malarat 11.viii.1978; deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the type locality.

Diagnosis. Male *Eucteniza huasteca* type specimen differs from all other *Eucteniza* species on the basis of its very small size, very pale yellow coloration, and by having a distinct patch of spines on the distal aspect of the palpal tibia (Figs 43, 44, 47); other species are typically larger in size, darker in coloration, and lack similar palpal tibia spination.

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Coloration faded. *General coloration.* Carapace yellowish red 5YR 5/8. Abdomen reddish yellow 7.5YR 6/8. *Cephalothorax.* Carapace 3.48 long, 2.53 wide, glabrous with sparse posterior fringe, pars cephalica low. Foveal groove procurved. Eyes slightly elevated. AER straight, PER slightly recurved. AME and PME subequal. Sternum with long setae, STRl 2.06, STRw 1.50. Posterior sternal sigilla large and elongate, but separated, anterior pairs marginal, difficult to see. Chelicerae with anterior tooth row comprising 6 teeth, posterior margin with 3 small denticles. Palpal endites and labium lack cuspules, LBw 0.54, LBl 0.28. Rastellum consists of 6 spines. *Abdomen.* Long thin setae. *Legs.* Leg I: 3.09, 1.47, 2.22, 2.22, 1.34; leg IV: 3.13, 1.25, 3.03, 2.81, 1.47. Very light scopulae on legs I-II. Tarsus with 4 trichobothria. Leg I spination pattern; TSp 6, TSr 0, TSrd 0 (Figs 43, 44, 47); Leg II spination pattern Figs 45, 47. *Pedipalp.* PTw 0.56, PTL 1.41, Bl 0.73. Embolus slender (Fig. 46).



Figures 43–47. *Eucteniza huasteca* sp. n. from Nuevo Leon, Mexico male holotype **43** retrolateral aspect, leg I [832040] **44** prolateral aspect, leg I [832036] **45** retrolateral aspect, leg II [832042] **46** retrolateral aspect, pedipalp [832044] **47** line drawings, leg I retrolateral and prolateral (tibia) aspects; prolateral aspect tibia leg II.

Variation. Known only from the type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known from Nueva Leon, Mexico, at La Huasteca Canyon (Fig. 1).

***Eucteniza zapatista* sp. n.**

<http://zoobank.org/D1B109F8-8692-4CCC-BBA6-57FF7EDAAFE2>

http://species-id.net/wiki/Eucteniza_zapatista

‘The Zapatista Trapdoor Spider’

Figs 1, 48–52

Type material. Male holotype (EU012), from Paso de Cortes, Puebla, Mexico, 19.1167–98.7667°, 3000m, coll. C. Bolivar 18.vii.1943. Male holotype deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the common name used for the Mexican Liberation Army of the South (Ejército Libertador del Sur) led by Emiliano Zapata (1879-1919).

Diagnosis. Male *Eucteniza zapatista* leg I morphology is similar to *E. diablo* however it lacks tarsal spines and has a more inflated or swollen tibia (Figs 48, 49, 52). Males can be further distinguished from all other species by having an extensive patch of spines on the retrolateral distal aspect of the palpal tibia (Figs 51, 52).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Coloration faded. *General coloration.* Carapace dark reddish brown 2.5YR 3/4. Abdomen reddish black 2.5YR 2.5/1. *Cephalothorax.* Carapace 6.13 long and 5.56 wide, with dense fringe of black setae. Foveal groove deep and procurved. AME slightly elevated in center. AER and PER relatively straight. AME slightly larger in diameter than PME. Sternum moderately setose, STRl 3.56, STRw 3.24. Posterior sternal sigilla large, elongate and contiguous, medial pair of anterior sigilla moderate in size and inset, anterior pair small and marginal. Chelicerae with anterior tooth row comprising 9 teeth, posterior margin with patch of approximately 20 small denticles. Palpal endites with very small, evenly distributed, poorly defined cuspules, LBw 1.26, LBl 0.75. Rastellum consists of 6 spines on a mound. *Legs.* Leg I 5.69, 3.00, 3.76, 3.68, 2.13; leg IV: 5.31, 2.80, 4.36, 4.80, 2.60. Very light tarsal scopulae on legs I, II, III. Leg I tibia with 2 very stout, short megaspines with prominent base; TSp 0, TSr 0, TSrd 0 (Figs 48, 49, 52); Leg II spination Fig. 50. *Pedipalp.* PTw 1.36, PTl 3.32, Bl 1.50. Embolus slightly flared tip; dense spine patch tibia distal retrolateral aspect (Figs 51, 52).

Variation. Known only from the single type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known only from the type locality, municipality of Puebla, Mexico (Fig. 1).

***Eucteniza chichimeca* sp. n.**

<http://zoobank.org/123BAC44-C19D-4131-8A37-9D6E43E8D178>

http://species-id.net/wiki/Eucteniza_chichimeca

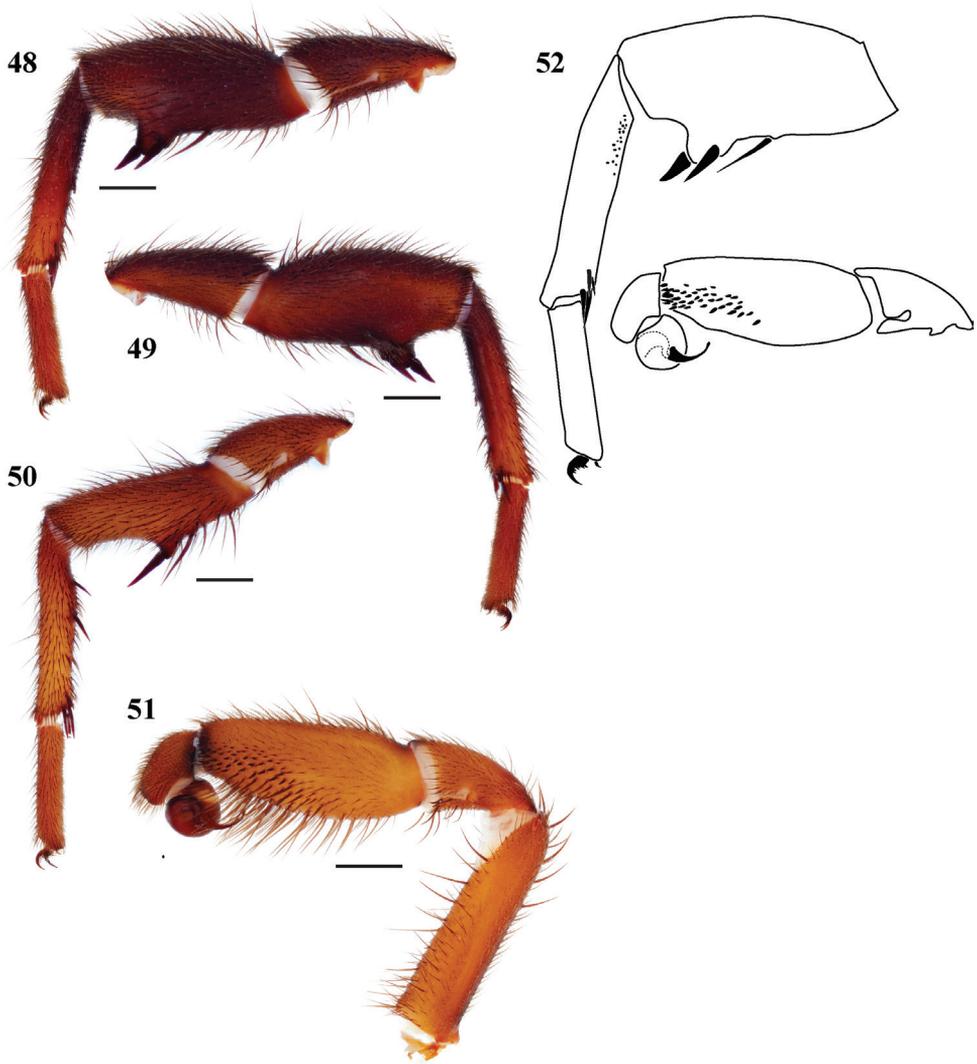
'The Chichimeca Jonaz Trapdoor Spider'

Figs 1, 53–57

Type material. Male holotype (EU010), from Querétaro, Mexico, 20km N Pinal de Amoles, 21.15 -99.65⁶, 2227m, coll. W. Russell, J. Greer 5-6.vi.1971. Male holotype deposited in AMNH.

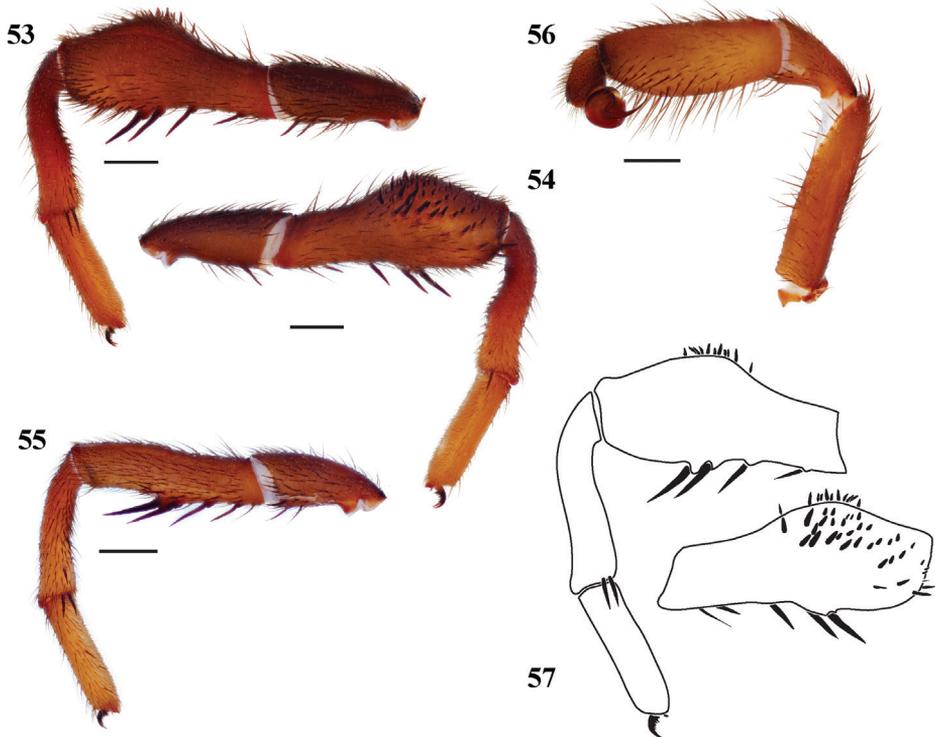
Etymology. The specific epithet is a noun taken in apposition and refers to one of the groups of people that are indigenous to the area around the type locality, the Chichimeca Jonaz.

Diagnosis. Male *Eucteniza chichimeca* specimens can be distinguished from all other *Eucteniza* species by virtue of having a tibia I that is swollen distal-dorsally and with numerous small prolateral spines (Figs 53, 54, 57).



Figures 48–52. *Eucteniza zapatista* sp. n. from Paso de Cortes, Puebla, Mexico, male holotype **48** retrolateral aspect, leg I [832010] **49** prolateral aspect, leg I [832006] **50** retrolateral aspect, leg II [832012] **51** retrolateral aspect, pedipalp [832014] **52** line drawings, leg I retrolateral aspect; pedipalp, retrolateral aspect.

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Color faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/3. Abdomen black 5YR 2.5/1. *Cephalothorax.* Carapace 5.88 long, 4.88 wide, glabrous, without fringe, pars cephalica moderately elevated. Foveal groove procurved. AER straight. PER very slightly recurved. AME and PME subequal. Sternum lightly setose, STRl 3.25, STRw 2.66. Chelicerae with anterior tooth row comprising 7 teeth, posterior margin with patch of approximately 10 small denticles. Palpal endites and labium without cuspsules,



Figures 53–57. *Eucteniza chichimeca* sp. n. from Querétaro, Mexico, male holotype **53** retrolateral aspect, leg I [832000] **54** prolateral aspect, leg I [831996] **55** retrolateral aspect, leg II [832002] **56** retrolateral aspect, pedipalp [832004] **57** line drawings, leg I retrolateral and prolateral (tibia) aspects.

LBw 1.13, LBl 0.69. Rastellum consists of 6 spines. *Abdomen.* Lightly setose. *Legs.* Leg I: 5.10, 3.00, 3.90, 3.30, 2.35; leg IV: 5.10, 2.00, 4.00, 4.00, 2.60. Scopulae present on legs I, II, lighter on legs III, IV. Leg I spination; TSp >30, TSr 0, TSrd 0 (Figs 53, 54, 57); Leg II spination Fig. 55. *Pedipalp.* PTw 1.28, PTL 3.16, Bl 1.31 (Fig. 56).

Variation. Known only from the type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known from the type locality, Querretara, Mexico (Fig. 1).

***Eucteniza ronnewtoni* sp. n.**

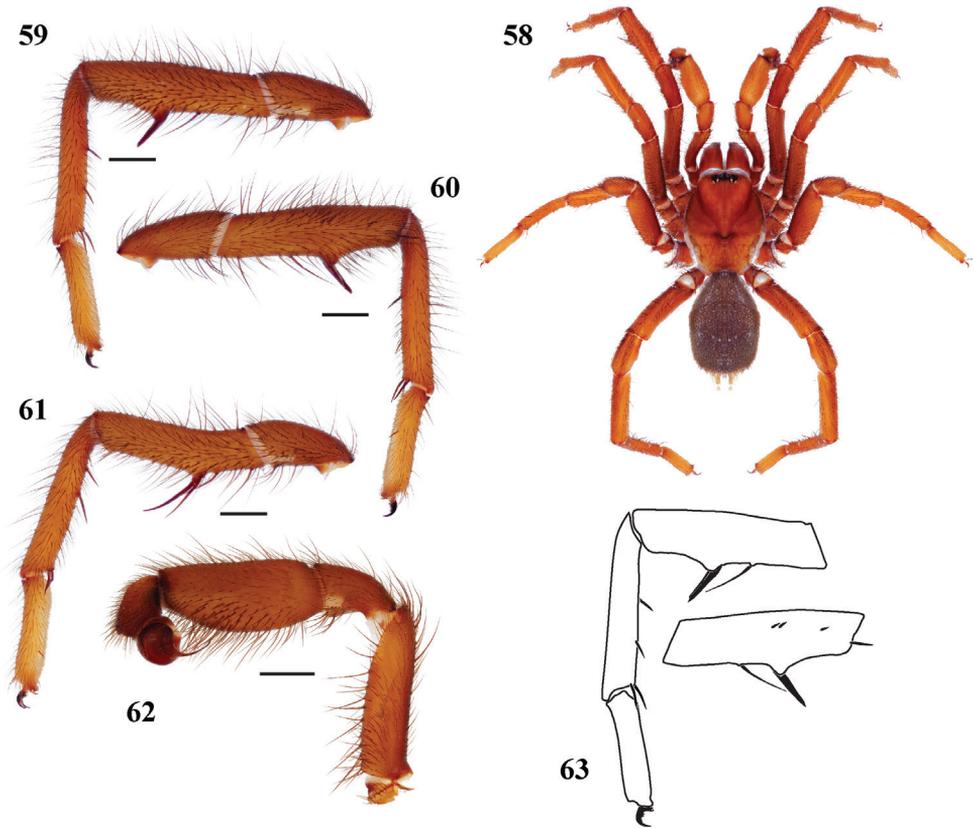
<http://zoobank.org/282930D5-1FEF-40EA-B479-EDBE8CEC24A0>

http://species-id.net/wiki/Eucteniza_ronnewtoni

‘Ron Newton’s Pecos River Trapdoor Spider’

Figs 1, 58–63

Type material. Male holotype (EU015), from Val Verde County, Texas, on rocks at bridge on Pecos River, 29.7079 -101.351⁴, 396m, coll. J.A. Brubaker, F.J. Moore



Figures 58–63. *Eucteniza ronnewtoni* sp. n. from Val Verde County, Texas, male holotype **58** habitus [832090] **59** retrolateral aspect, leg I [832020] **60** prolateral aspect, leg I [832016] **61** retrolateral aspect, leg II [832022] **62** retrolateral aspect, pedipalp [832024] **63** line drawings, leg I retrolateral and prolateral (tibia) aspects.

2.ix.1968. Male holotype deposited in AMNH. Male paratype (EU080), from Sandy Canyon, 18 rd mi NE of Saucedo, 29.5550 -103.7933¹, 1212m, coll. N.I. Platnick 4.x.2005. Male paratype deposited in AMNH.

Etymology. The specific epithet is a patronym in honor of Dr. Ronald Newton, biologist and Texas native.

Diagnosis. Male *Eucteniza ronnewtoni* specimens are similar in appearance to *E. relata* but have a more slender tibia I that has only a few small spines on the prolateral surface none of which are positioned distally (Figs 59, 60, 63).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Multiple legs removed, stored in vial with specimen. Color faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/4. Abdomen very dark red 2.5YR 2.5/2. *Cephalothorax.* Carapace 5.44 long, 4.56 wide, glabrous, pars cephalica moderately elevated (Fig. 58). Fringe on posterior margin of light, black

setae. Foveal groove deep, procurved. Tubercle absent. AER straight. PER slightly recurved. AME slightly larger in diameter than PME. Sternum lightly setose, STRl 3.41, STRw 2.91. Posterior sternal sigilla very large, not quite contiguous, medial anterior sigilla pair moderate in size, offset from margin, anterior pair not visible. Chelicerae with anterior tooth row comprising 5 large teeth, posterior margin with single row of 4 small teeth. Palpal endites with numerous cuspules across endite face, labium with 15 small cuspules, LBw 1.13, LBl 0.84. Rastellum consists of 8 small spines. *Abdomen*. Moderately setose. *Legs*. Leg I: 5.31, 2.40, 3.88, 3.68, 2.28; leg IV: 5.00, 1.88, 2.50, 3.28, 2.81. Light scopulae on legs I-IV. Tarsus I with wide band of 12 trichobothria. Leg I spination pattern; TSp 4, TSr 0, TSrd 0 (Figs 59, 60, 63); Leg II spination Fig. 61. *Pedipalp*. PTw 1.31, PTl 2.94, Bl 1.58 (Fig. 62). Embolus arises sharply from bulb and tapers quickly, slightly flared at tip.

Variation. Known only from the type specimens.

Description of female. Known only from the male type specimens.

Distribution. Known from the type locality, Pecos River, Val Verde Co., Texas (Fig. 1).

***Eucteniza hidalgo* sp. n.**

<http://zoobank.org/57B349E5-04EC-4D8E-A609-FEC414FB015B>

http://species-id.net/wiki/Eucteniza_hidalgo

'The Hidalgo Trapdoor Spider'

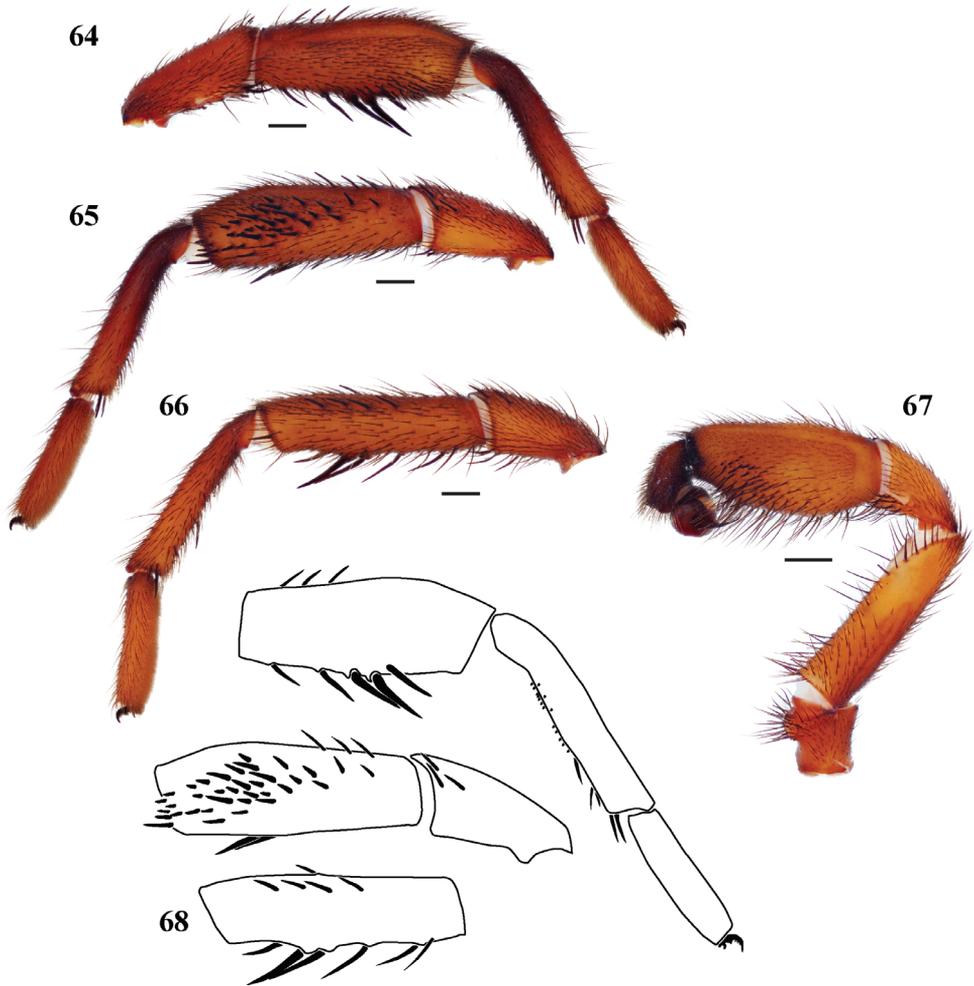
Figs 1, 64–68

Type material. Male holotype (EU047), from Hidalgo, Mexico. 20.6649 -99.0098⁸, 1509m, coll. T.C. Kaspar 2.viii.1973; deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the type locality in the state of Hidalgo, also used in reference to a person of noble or generous spirit.

Diagnosis. The male *Eucteniza hidalgo* specimen differs from all other *Eucteniza* species by virtue of having an extensive prolateral tibia I spine patch, ventral metatarsus microspines, and a sub-dorsal row of spines on the prolateral surface of tibia II (Figs 64–68).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Multiple legs removed, stored in vial with specimen. Color faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/4. Abdomen dark yellowish brown 10YR 4/6. *Cephalothorax.* Carapace 8.576 long, 7.263 wide, glabrous to sparsely setose posteriorly, pars cephalica very slightly elevated. Fringe on posterior margin with light, black setae. Foveal groove deep, procurved. Tubercle absent. AER very slightly procurved. PER slightly recurved. AME slightly larger in diameter than PME. Sternum setose, STRl 4.804, STRw 4.360. Posterior sternal sigilla very large, not quite contiguous, medial anterior sigilla pair moderate in size and marginal, anterior pair very small and marginal. Chelicerae with anterior tooth row comprising 8 large



Figures 64–68. *Eucteniza hidalgo* sp. n. from Hidalgo, Mexico, male holotype **64** retrolateral aspect, right leg I [832026] **65** prolateral aspect, right leg I [832030] **66** prolateral aspect, right leg II [832032] **67** retrolateral aspect, pedipalp [832034] **68** line drawings, right leg I retrolateral and prolateral (tibia) aspects, right leg II prolateral aspect of tibia.

teeth, posterior margin with single row of 3 small teeth surrounded in small denticles. Palpal endites without cuspules across endite face, labium also without cuspules, LBw 1.457, LBl 0.938. Rastellum consists of 4 spines on a mound. *Abdomen.* Moderately setose. *Legs.* Leg I: 7.759, 4.371, 5.864, 5.384, 3.528; leg IV: 8.193, 4.059, 7.183, 7.257, 4.683. Light scopulae on legs I–II. Tarsus I with wide band of 10 trichobothria. Leg I spination pattern; TSp 34, TSr 0, TSrd 0 (Figs 64, 65, 68); Leg II spination pattern Figs 66, 68. *Pedipalp.* PTw 2.044, PTl 4.104, Bl 1.704. Embolus arises sharply from bulb and tapers quickly, slightly geniculate at tip (Fig. 67).

Variation. Known only from the type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known only from the type locality, Hidalgo, Mexico.

***Eucteniza golondrina* sp. n.**

<http://zoobank.org/052429B4-EAE8-49D8-9FB4-C62128BAE9FE>

http://species-id.net/wiki/Eucteniza_golondrina

'The Golondrina Trapdoor Spider'

Figs 1, 69–73

Type material. Male holotype (UMM117) from Sótano de las Golondrinas, Aquismón, San Luis Potosí, Mexico, 21.6263 -99.0292⁴, elev. 164m, coll. A. G. Grubbs xi.1987, deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the type locality Sótano de las Golondrinas (= Cave of Swallows).

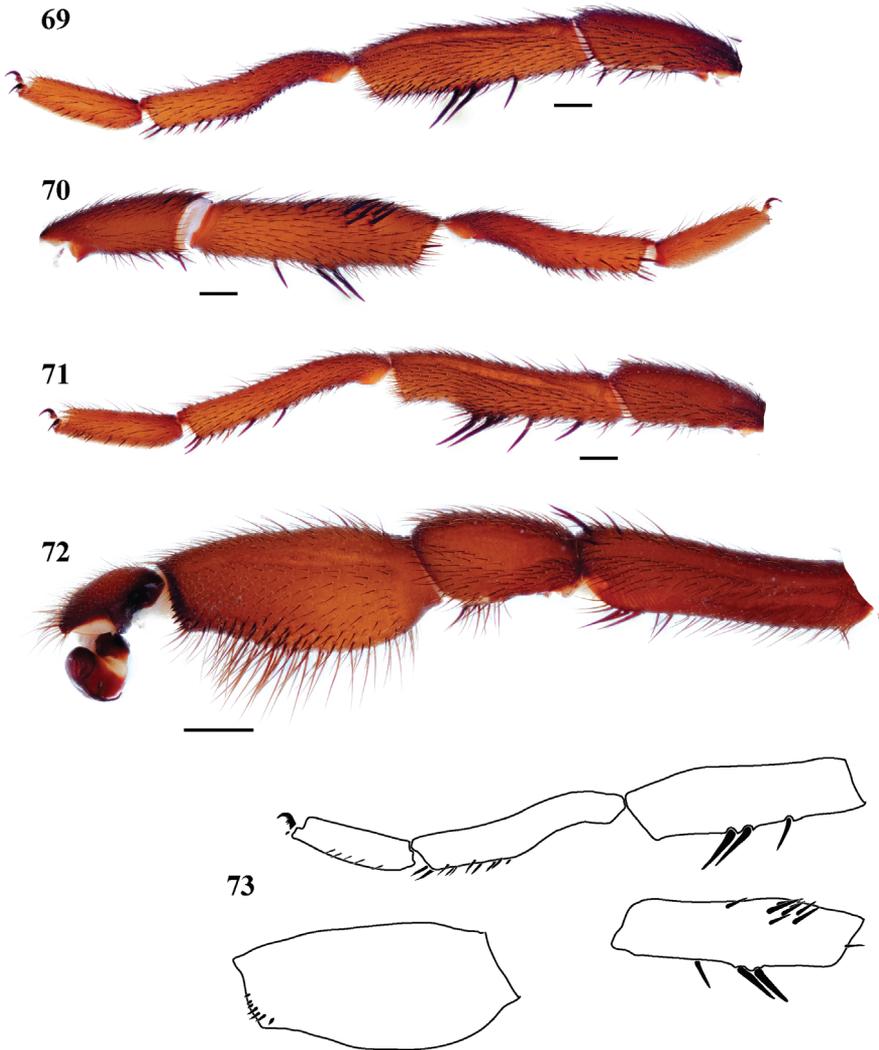
Diagnosis. The male *Eucteniza golondrina* type specimen differs from all other species of *Eucteniza* by virtue of a distinct leg I morphology that includes a unique group of distal spines on the ventral surface of metatarsus I (Figs 69, 70, 73); the palpal tibia of *E. golondrina* also has a retrolateral distal row of spines that is lacking in all other known species (Figs 72, 73).

Description of male holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH. Pedipalp, legs I, II removed, stored in vial with specimen. Color faded. *General coloration.* Carapace dark reddish brown 2.5YR 2.5/4. Abdomen black 10YR 2/1. *Cephalothorax.* Carapace 8.478 long, 7.437 wide, sparsely setose, few heavy setae posteriorly, pars cephalica slightly elevated. Fringe of sparse, heavy setae at posterior corners of carapace. Foveal groove deep, procurved. Tubercle absent. AER straight. PER straight. AME slightly larger in diameter than PME. Sternum moderately setose, STRl 4.695, STRw 3.874. Posterior sternal sigilla very large, not contiguous, tapering posteriorly, anterior sigilla pairs small and marginal. Chelicerae with anterior tooth row comprising 11 large teeth, posterior margin with single row of 14 small teeth. Palpal endites with few cuspules across endite face, labium lacking cuspules, LBw 1.377, LBl 0.758. Rastellum consists of 4 small spines. *Abdomen.* Moderately setose. *Legs.* Leg I: 8.354, 4.595, 6.006, 5.792, 3.034; leg IV: 8.586, 4.081, 6.970, 7.841, 4.161. Dense scopulae on legs I-II. Tarsus I with wide band of approximately 23 trichobothria. Leg I spination pattern; TSp 8, TSr 0, TSrd 0 (Figs 69, 70, 73); Leg II spination Fig. 71. *Pedipalp.* PTw 1.877, PTl 3.729, Bl 1.556. Embolus arises sharply from bulb and tapers quickly, geniculate at tip (Fig. 72); unique retrolateral distal row of tibial spines (Figs 72, 73).

Variation. Known only from the type specimen.

Description of female. Known only from the male holotype specimen.

Distribution. Known only from the type locality, San Luis Potosí, Mexico.



Figures 69–73. *Eucteniza golondrina* sp. n. from San Luis Potosí, Mexico, male holotype **69** retrolateral aspect, leg I [832104] **70** prolateral aspect, leg I [832100] **71** retrolateral aspect, leg II [832108] **72** retrolateral aspect, pedipalp [832106] **73** line drawings, leg I retrolateral and prolateral (tibia) aspects; retrolateral aspect, palpal tibia.

***Eucteniza panchovillai* sp. n.**

<http://zoobank.org/016EFBFF-8C22-45B6-B3DA-55864B5F6248>

http://species-id.net/wiki/Eucteniza_panchovillai

‘Pancho Villa’s Trapdoor Spider’

Figs 1, 74

Type material. Female holotype (EU060) and paratype (EU068), from San Juan del Rio, Durango, Mexico, 24.7833 -104.4500^s, 1789m, coll. W. Gertsch 1.viii.1947. Female holotype deposited in AMNH.

Etymology. The specific epithet is a patronym named for Mexican historical figure Pancho Villa.

Diagnosis. Female specimens of *Eucteniza panchovillai* can be distinguished from all other known species by having spermathecae that comprise a long lateral extension and a slender stalk that curves distally into a small terminal bulb; all other species have shorter thicker stalks that do not curve distally and terminate in a larger bulb that exceeds the stalk diameter (Fig. 74).

Description of female holotype. *Specimen preparation and condition.* Specimens preserved in 70% EtOH. Color faded. *Color.* Carapace yellowish red 5YR 4/6. Abdomen yellowish brown 10YR 5/6. *Cephalothorax.* Carapace 8.827 long, 8.064 wide, sparsely setose. Fringe absent. Foveal groove deep and procurved. Tubercle absent. AER procurved, PER slightly recurved. AME slightly larger in diameter than PME. Sternum moderately setose, STRl 5.364, STRw 5.318. Posterior sigilla large and nearly contiguous and irregular in shape, medial pair of anterior sigilla moderate in size and inset, nearly contiguous with posterior pair, anterior pair small and marginal. Chelicerae with anterior tooth row armed with 7 teeth with posterior margin comprising a long patch of many small denticles. Palpal cuspules numerous and widespread across endites; labium with 7 cuspules, LBw 2.033, LBl 1.446. Rastellum consists of 9 spines positioned on a small mound. *Walking legs.* Leg I 20.557 long. Tarsus I with 8 trichobothria clustered proximally. Legs I, II with dense scopulae. PTLs 64, TBs 19. Preening combs present. Spermathecae with enlarged laterally extended base, curved distally, terminal bulb width subequal to stalk (Fig. 74).

Variation (3). Cl 8.01-9.87, 9.07±0.31; Cw 7.06-8.59, 8.12±0.27; STRl 4.52-5.8, 5.37±0.22; STRw 4.55-5.58, 5.24±0.19; LBw 1.66-2.25, 1.92±0.11; LBl 1.17-1.54, 1.31±0.07; Leg I: 18.61-21.79, 20.47±0.56; ANTd 7-9, 8.2±0.37; PTLs 25-38, 32±2.43; TBs 12-22, 15.6±1.94.

Description of male. Known only from the female type specimens.

Additional material examined. **Mexico: Durango:** San Juan del Rio, 24.7833 -104.4500⁵, 1789m, W Gertsch 1.viii.1947 [EU060, 068, 4♀, AMNH].

Distribution. Known only from the type locality, Durango, Mexico.

***Eucteniza rosalia* sp. n.**

<http://zoobank.org/8DE1B8F8-0C9F-4D82-A81A-1700C90549B4>

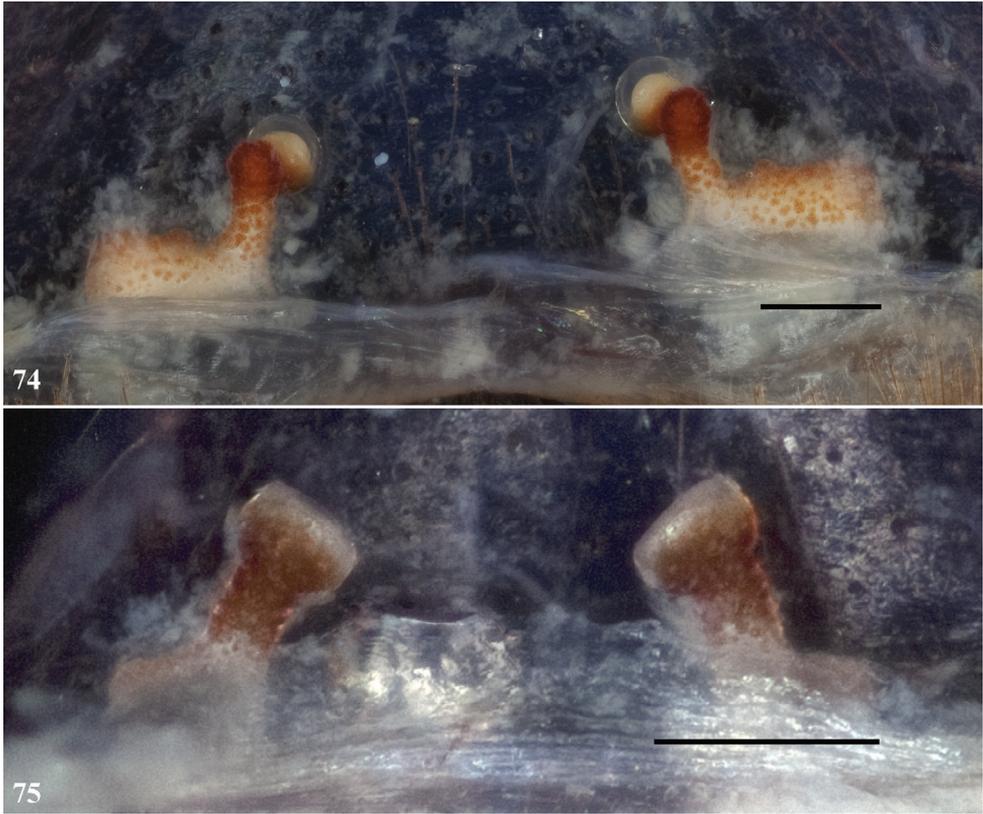
http://species-id.net/wiki/Eucteniza_rosalia

'The Río de Santa Rosalía Trapdoor spider'

Figs 1, 75

Type material. Female holotype (EU101), Mulegé, Baja California Sur, Mexico, 26.8905 -111.981⁵, 10m, coll. V. Roth 26.i.1965, deposited in AMNH.

Etymology. The specific epithet is a noun taken in apposition and is in reference to the Río de Santa Rosalía near the type locality.



Figures 74, 75. **74, 75** cleared spermathecae, scale bar = 0.1mm **74** *Eucteniza panchovillai* sp. n. female holotype from Durango, Mexico [832095] **75** *Eucteniza rosalia* sp. n. female holotype from Baja California Sur, Mexico [832097].

Diagnosis. *Eucteniza rosalia* can be distinguished from other known Baja California taxa for which females are known by having a pronounced spermathecal lateral base extension by having a distally squared bulb (Fig. 75) as opposed to rounded. The spermathecal stalk in *E. diablo* is noticeably shorter and lacks a distinct lateral basal extension (Fig. 36).

Description of female holotype. *Specimen preparation and condition.* Specimen preserved in 70% EtOH; color likely faded. *Color.* Carapace dark reddish brown 5YR 3/4. Abdomen dark yellowish brown 10YR 4/4. *Cephalothorax.* Carapace 5.332 long, 4.666 wide, sparsely setose. Fringe absent. Foveal groove deep and procurved. Tubercle absent. AER procurved, PER recurved. AME very slightly larger in diameter than PME. Sternum moderately setose, STRl 3.124, STRw 2.969. Posterior sigilla large and not contiguous, medial pair of anterior sigilla moderate in size and inset, anterior pair small and marginal. Chelicerae anterior tooth row armed with 6 teeth with posterior margin comprising a row of 9 small denticles. Palpal cuspules numerous and widespread across endites; labium with 11 cuspules, LBw 1.033, LBl 0.855. Rastellum consists of 7 spines positioned on a

small mound. *Walking legs*. Leg I 11.219 long. Tarsus I with 10 trichobothria clustered proximally. Legs I, II with dense scopulae. PTLs 20, TBs 12. Preening combs absent. Spermathecae with moderately sized lateral base, terminal bulb square (Fig. 75).

Variation. Known only from type specimen.

Description of male. Known only from the female type specimens.

Distribution. Known only from the type locality, Baja California Sur, Mexico.

Acknowledgments

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Appendix

Locality data for *Eucteniza* specimens. (doi: 10.3897/zookeys.356.6227.app) File format: Microsoft Excel comma delimited (.csv).

Explanation note: Locality data for *Eucteniza* specimens examined over the course of this study and listed in material examined section that accompanies each species.

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Citation: Bond JE, Godwin RL (2013) Taxonomic revision of the Trapdoor spider genus *Eucteniza* Ausserer (Araneae, Mygalomorphae, Euctenizidae). ZooKeys 356: 31–67. doi: 10.3897/zookeys.356.6227 Locality data for *Eucteniza* specimens. doi: 10.3897/zookeys.356.6227.app

Diversity of *Ptychadena* in Rwanda and taxonomic status of *P. chrysogaster* Laurent, 1954 (Amphibia, Anura, Ptychadenidae)

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Abstract

We assess the diversity of *Ptychadena* species in Rwanda based on re-examination of voucher specimens in museum collections and our own data from recent assessment of the species composition of amphibian communities in Rwanda. We recognize five species which we allocate to the following available names: *P. anchietae*, *P. chrysogaster*, *P. nilotica*, *P. porosissima*, and *P. uzungwensis*. We did not find evidence for the presence of *P. grandisonae* and *P. oxyrhynchus* which have been listed for the country. The five species can be distinguished by quantitative morphometrics (discriminant analysis, success rate: 100 %) and a number of qualitative characters of external morphology. We provide an identification key to the Rwandan species and describe the morphology of each species in detail. The taxonomic status and the phylogenetic position of *Ptychadena chrysogaster* are further assessed based on the partial sequence of the mitochondrial 16S rRNA. The species differs genetically from available homologous sequences from congeners by an uncorrected p distance of at least 4.2 % and appears to be most closely related to specimens assigned to *P. porosissima*, *P. mahnerti*, “*P. aff. uzungwensis*” and “*P. aff. bibroni*”.

Keywords

P. anchietae, *P. grandisonae*, *P. nilotica*, *P. porosissima*, *P. uzungwensis*, DNA barcoding, systematics

Introduction

Ridged Frogs of the genus *Ptychadena* Boulenger, 1917 are widespread in sub-Saharan Africa where approximately 50 species occur. Species of the genus share a similar general appearance and many are poorly delimited, having been described based on taxonomically doubtful characters. Several species names have been erroneously considered synonyms of others, thus confusing character diagnoses in subsequent accounts; and some taxa were described based on specimens later found to represent more than one species (e.g. Boulenger 1879; Loveridge 1932; Laurent 1954; Guibé and Lamotte 1957; Schmidt and Inger 1959; Lamotte 1967; Poynton 1970; Rödel 2000; Channing 2001; Channing and Howell 2006; Dehling and Sinsch in press). Therefore, even the local/regional diversity of these frogs is often difficult to assess. Herein, we address the diversity of Ridged Frogs in Rwanda. We have recently shown that three species (*P. anchietae* [Bocage, 1868], *P. nilotica* [Seetzen, 1855], and *P. porosissima* [Steindachner, 1867]) inhabit the wetlands along the upper Nile (Dehling and Sinsch in press). Further taxa have been reported from Rwanda and it is currently unclear which species actually occur in the country. Nieden (1913) reported *P. nilotica* (referred to as *Rana mascareniensis* Duméril & Bibron, 1841) from several localities in Rwanda. Based on his own collections, Laurent (1954) reported *P. uzungwensis* (Loveridge, 1932) and described *P. chrysogaster* Laurent, 1954 and *P. loveridgei* Laurent, 1954 as new species, the latter now being considered a synonym of *P. porosissima* (Schmidt and Inger 1959). Poynton and Broadley (1985), Channing (2001), and Poynton and Channing (2004) stated that *P. grandisonae* Laurent, 1954 occurs in Rwanda. Fischer and Hinkel (1992) listed only “*P. mascareniensis*” [= *P. nilotica*]. Poynton et al. (2004) stated that *P. anchietae* was likely to occur in Rwanda but confirmed records were missing. According to Spawls et al. (2006), *P. chrysogaster*, *P. mascareniensis*, and *P. uzungwensis* occur in Rwanda but not *P. anchietae* and *P. porosissima*. Branch (2005) included Rwanda in the geographic range of *P. oxyrhynchus* (Smith, 1849). Recently, we collected *P. anchietae* in Rwanda and resurrected the name *P. nilotica* for the populations which occur along the Nile and in Central Kenya and Tanzania and which had been formerly referred to as *Rana mascareniensis* or *Ptychadena mascareniensis* (Sinsch et al. 2012, Dehling and Sinsch in press).

In order to clarify how many and which species occur in Rwanda, we re-examined the specimens of *Ptychadena* in the herpetological collection of the Royal Museum for Central Africa in Tervuren, Belgium (RMCA), on which almost all previous Rwandan records are based. We herein report the results and compare the findings to our own data from recent assessment of the composition of amphibian communities at numerous locations in Rwanda. We further assess the taxonomic status and the phylogenetic position of *Ptychadena chrysogaster* based on examination of most of the available voucher material from Rwanda including the type series and on comparison of the partial sequence of the mitochondrial 16S rRNA gene with homologous sequences of its congeners.

Material and methods

Morphological examination

We examined voucher specimens deposited at RMCA. Additional specimens including our recently collected material are deposited in the collection of the Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany (ZFMK). See Appendix 1 for a complete list of examined specimens.

For the morphological analysis, we took the following 18 measurements to the nearest 0.1 mm using digital calipers, following Dehling and Sinsch (in press): (1) Snout-vent length (SVL); (2) tibiofibula length (TFL, measured with both knee and tibio-tarsal articulation flexed); (3) thigh length (THL, from vent to knee with thigh being held vertically to median body plane and knee flexed); (4) total hindlimb length (LEG, from vent to tip of fourth toe with leg fully extended and being held vertically to median body plane); (5) tarsus + foot length (TarL, from tibio-tarsal articulation to tip of fourth toe); (6) foot length (FOT, from proximal end of inner metatarsal tubercle to tip of fourth toe); (7) forearm + hand length (ARM, distance from elbow to tip of third finger); (8) hand length (HND, distance from proximal end of inner palmar tubercle to tip of third finger); (9) head width (HW, measured at the level of the jaw joint); (10) head length (HL, distance from posterior end of mandible to tip of snout); (11) interorbital distance (IO, shortest distance between upper eyelids); (12) upper eyelid width (EW); (13) horizontal eye diameter (ED); (14) horizontal tympanum diameter (TD); (15) eye to nostril distance (EN, distance between anterior margin of eye and centre of nostril); (16) nostril to snout distance (NS, distance between centre of nostril and tip of snout); (17) snout length (SL, distance between anterior margin of eye to tip of snout); (18) internarial distance (NN, distance between centres of nostrils). To avoid an inter-observer bias, all measurements were taken by JMD. Additionally, we recorded the following qualitative characters: (1) position of external vocal sac aperture in males; (2) number of longitudinal dorsal dermal ridges; (3) texture of ventral skin; (4) extent of nuptial pads in males; (5) number of supernumerary metacarpal tubercles; (6) size and shape of thenar and palmar tubercles; (7) extent of toe webbing; (8) presence of outer metatarsal tubercle; (9) relative size of inner metatarsal tubercle; (10) ventral colouration; (11) presence of light line on dorsal face of tibia; (12) presence of light band on dorsum; (13) presence of dark brown stripe on preaxial side of tarsus; (14) colour of external dorsal fold; (15) colour pattern on postaxial side of femur. Sex of males was determined by presence of secondary sexual characteristics (vocal slits, nuptial pads), that of females by either examination of gonads through dissection or size (female if larger than smallest 10 percent of adult males). The webbing formulae are given as proposed by Myers and Duellman (1982). Terminology for dermal dorsal ridges and orientation of external vocal sac aperture follows Perret (1979).

Statistical Analyses

Descriptive statistics depended on the outcome of the test for normality. Normally distributed data were described by the arithmetic mean and corresponding standard error and/or range, those deviating significantly by median and range. Principal component analyses were run on the morphometric data set including 18 variables and 89 observations each (*P. anchietae*: 15 males, 3 females; *P. chrysogaster*: 13 males, 10 females; *P. nilotica*: 13 males, 10 females; *P. porosissima*: 11 males, 7 females; *P. uzungwensis*: 6 males, 1 female). We compared the scores obtained for the principal components 2 and 3 describing shape to distinguish taxa without *a priori* assignment to taxa. The morphometric distances were adjusted for SVL by calculating a linear regression of each variable against SVL and storing the residuals as representatives of size-independent shape variables. This transformed data set was used for discriminant analyses with taxa as predefined groups to optimize distinction. To account for sexual dimorphism, discriminant analyses were run separately for males (n=58) and females (n=31). Significance level was set at $\alpha = 0.05$. All calculations were based on the procedures of the program package STATGRAPHICS centurion for Windows, version XV.

DNA barcoding and phylogenetic analyses

We isolated DNA from a liver tissue sample from a specimen of *Ptychadena chrysogaster* (ZFMK 58797), collected in southern Rwanda by H. Hinkel in 1993. DNA was used to sequence a fragment of the 16S mitochondrial rRNA gene, a universal marker to barcode amphibian species (Vences et al. 2005). Protocols of DNA extraction, PCR, purification, and sequencing follow Dehling and Sinsch (in press). The obtained sequence was compared with those in GenBank using a standard nucleotide-nucleotide BLAST search and with our own sequences from Rwandan specimens and was incorporated into an existing alignment (see Dehling and Sinsch in press for a list of sequences and GenBank Accession numbers). Editing and alignment were completed in MEGA5 (Tamura et al. 2011). Sequences were trimmed to the same length. The final alignment consisted of 548 base pairs. Calculations of pairwise distances and phylogenetic analysis (Maximum Likelihood) were carried out in MEGA5. Maximum Likelihood analysis was run using the GTR + G + I model and the Nearest-Neighbor-Interchange with 1000 bootstrap replicates.

Results

Examination of specimens suggested that five morphologically distinct species were present in Rwanda to which we assign the following names: *Ptychadena anchietae*, *P. chrysogaster*, *P. nilotica*, *P. porosissima*, and *P. uzungwensis* (Figures 1 and 2). For allocation of specimens to *P. anchietae*, *P. nilotica*, and *P. porosissima* and discussion thereof



Figure 1. Males of *Ptychadena* from Rwanda in life. **A** *P. anchietae* **B** *P. chrysogaster* [Foto: E. Fischer] **C** *P. nilotica* **D** *P. porosissima*.

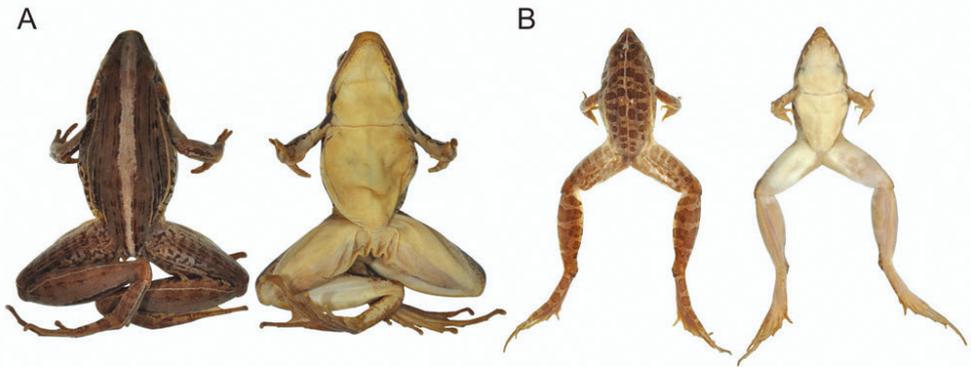


Figure 2. **A** Preserved female holotype of *Ptychadena chrysogaster* (RMCA 109096) from Lac Karago, Rwanda; dorsal view (left) and ventral view (right) **B** Preserved male specimen of *P. uzungwensis* (RMCA 108993-108997) from Munini, Rwanda; dorsal view (left) and ventral view (right). Not to scale.

see Dehling and Sinsch (in press). The examined material included type specimens of both of *P. chrysogaster* and *P. uzungwensis* (Appendix 1). Allocation of other specimens to the latter two species is based on direct comparison with the type material. We re-assigned several specimens that had been deposited in the museum collections under wrong names. Noteworthy are two of the paratypes of *P. chrysogaster* (RMCA 41989, 41994) which belong in fact to *P. porosissima*.

Morphological differentiation

The morphometric features of the five species are summarized in Table 2. Principal component analysis yielded three PCs accounting for 89.6% of total variation (Table 3A). PC1 represented variation in size, whereas the shape-related PC2 and PC3 were mainly loaded by features describing head morphology (Table 3B). In females, PC 2 unequivocally distinguished *P. nilotica* from the other taxa, and PC 3 unequivocally distinguished *P. chrysogaster* from *P. anchietae*, *P. porosissima*, and *P. uzungwensis* (Figure 3A). Also, *P. anchietae* and *P. uzungwensis* could be distinguished from each other. However, both species were represented by only few individuals (three and one, respectively) in the analysis. The two species did not differ significantly in shape from *P. porosissima* (Figure 3A). A similar pattern was observed in the analysis of the males (Figure 3B) but males of all five species were generally more similar to each other in shape. Males of *P. nilotica* could be distinguished unequivocally from males of *P. chrysogaster* and *P. uzungwensis* but not from some of the males of *P. anchietae* and *P. porosissima* (Figure 3B). Males of *P. chrysogaster* could be distinguished from males of all other species but some of the males of *P. anchietae* and *P. uzungwensis* were very similar in shape (Figure 3B). Males of *P. anchietae* did not differ significantly in shape from males of *P. nilotica*, *P. porosissima*, and *P. uzungwensis*. Gender-specific discriminant analyses based on the residuals of 17 SVL-adjusted morphometric variables had a classification success of 100 % among the five species in both males and females (Table 4A, B, C, Figure 4A, B).

The five Rwandan species can be distinguished unequivocally from each other using a combination of qualitative morphological characters (Table 1, Figure 5; see also Dehling and Sinsch in press). An identification key based on these characters is given below. Detailed morphological descriptions of the species are in Appendix 2.

Key to the Rwandan species of *Ptychadena*

- 1 external vocal sac apertures and nuptial pads on dorsal side of metacarpals and phalanges of Fingers I–III present **adult males...2**
- external vocal sac apertures and nuptial pads absent.....
.....**adult females and subadults...6**
- 2 vocal sac aperture superior; only one supernumerary metacarpal tubercle proximal to Finger IV, often indistinct; longitudinal, alternately black and yellow coloured bands on postaxial side of femur.....***P. nilotica***
(spiny tubercles on venter absent; inner metatarsal tubercle less than half the length of metatarsus of Toe I; distal subarticular tubercles of Toes III and V reaching to knee; toe webbing I(1.5–1.75)-(2–2.25)II1.5-(2.75–3) III(1.75–2)-3IV2.75-(1–1.5)V; ventral side of head white, mottled with grey)
- vocal sac aperture inferior or semi-inferior; at least one supernumerary metacarpal tubercle proximal to each finger; colouration on postaxial side of femur different..... **3**

- 3 spiny tubercles on venter absent; toe webbing reaching distal phalanx on postaxial sides of Toes I, II, and III and on preaxial side of Toe V; external dorsal ridge usually not light and prominent..... ***P. anchietae*** (vocal sac aperture inferior; distal subarticular tubercles of Toes III and V never reaching knee; inner metatarsal tubercle about half the length of metatarsus of Toe I; ventral side of head white, trunk yellow; light tibial line and light dorsal band absent; dark spots on dorsum usually absent, if present, small and narrow; irregularly delimited, reticulated, longitudinal, alternately yellow and dark brown coloured bands on postaxial side of femur)
- spiny tubercles on venter present; toe webbing not reaching distal phalanges on toes; external dorsal ridge light and prominent **4**
- 4 median dorsal ridge extending to level between nostrils on dorsal side of snout; vocal sac aperture semi-inferior; two supernumerary metacarpal tubercles proximal to Finger II; inner and outer palmar tubercle more or less equal in length; inner metatarsal tubercle about half the length of metatarsus of Toe I ***P. uzungwensis***
- median dorsal ridge extending to level between eyelids only; vocal sac aperture inferior; one supernumerary metacarpal tubercle proximal to Finger II; outer palmar tubercle longer than inner; inner metatarsal tubercle either more than or less than half the length of metatarsus of Toe I **5**
- 5 foot large, tips of Toes III and V reaching distinctly beyond knee, their distal subarticular tubercles reaching knee; ventral tubercles tiny, hardly visible with naked eye; inner metatarsal tubercle less than half the length of metatarsus of Toe I; dark brown stripe present on preaxial side of tibia; thenar tubercle approximately as long as outer palmar tubercle; webbing not reaching beyond distal subarticular tubercle on postaxial side of Toe III; dorsal spots small and narrow; irregularly delimited, reticulated, longitudinal dark bands on light background on postaxial side of femur..... ***P. chrysogaster***
- foot smaller, tips of Toes III and V at most reaching slightly beyond knee, their distal subarticular tubercles not reaching knee; ventral tubercles large, visible with naked eye, palpable with finger; inner metatarsal tubercle more than half the length of metatarsus of Toe I; dark brown stripe absent on preaxial side of tibia; thenar tubercle longer than outer palmar tubercle; webbing reaching beyond distal subarticular tubercle on postaxial side of Toe III; dorsal spots large and wide; yellow spots, diffusely arranged in longitudinal rows on dark brown background on postaxial side of femur ***P. porosissima***
- 6 median dorsal ridge extending to level between nostrils on dorsal side of snout; two supernumerary metacarpal tubercles proximal to Finger II... ***P. uzungwensis*** (inner metatarsal tubercle about half the length of metatarsus of Toe I; distal subarticular tubercles of Toes III and V not reaching to knee; toe webbing I2-(2.25–2.5)II1.5–3III(1.75–2)-3IV3-(1+–1.25)V; light tibial line absent; light dorsal band present; dark spots on dorsum large and wide, often fused with neighboring ones; light, prominent dorsolateral fold present)

- median dorsal ridge extending to level between eyelids only; one or no supernumerary metacarpal tubercle proximal to Finger II 7
- 7 toe webbing reaching to distal phalanx on postaxial sides of Toes I, II, and III and on preaxial side of Toe V; light prominent external dorsal ridge usually absent; inner metatarsal tubercle about half the length of metatarsus of Toe I ..
..... ***P. anchietae***
(tips of Toes III and V at most reaching slightly beyond knee, their distal sub-articular tubercles not reaching knee; ventral side of head white, trunk yellow; light tibial line and light dorsal band absent; dark spots on dorsum usually absent, if present, small and narrow; irregularly delimited, reticulated, longitudinal, alternately yellow and dark brown coloured bands on postaxial side of femur)
- toe webbing not reaching to distal phalanx on toes; light prominent external dorsal ridge present; inner metatarsal tubercle either less than or more than half the length of metatarsus of Toe I **8**
- 8 inner metatarsal tubercle more than half the length of metatarsus of Toe I; tips of Toes III and V at most reaching slightly beyond knee, their distal subarticular tubercles not reaching knee; thenar tubercle longer than outer palmar tubercle; yellow spots, diffusely arranged in longitudinal rows on dark brown background on postaxial side of femur ***P. porosissima***
- inner metatarsal tubercle less than half the length of metatarsus of Toe I; tips of Toes III and V reaching distinctly beyond knee, their distal subarticular tubercles reaching knee; thenar tubercle about as long as outer palmar tubercle; colouration on postaxial side of femur not consisting of spots..... **9**
- 9 dorsal spots small and narrow; one supernumerary metacarpal tubercle proximal to each finger; ventral side of head and chest yellow; dark brown stripe present on preaxial side of tibia; irregularly delimited, reticulated, longitudinal dark bands on light background on postaxial side of femur; webbing not reaching beyond subarticular tubercle on Toe I ***P. chrysogaster***
- dorsal spots large and wide; only one supernumerary metacarpal tubercle proximal to Finger IV, often indistinct; ventral side of head and chest white; dark brown stripe on preaxial side of tibia absent, few specimens with dark mottling, not forming continuous stripe; longitudinal, alternately black and yellow coloured bands on postaxial side of femur; webbing reaching beyond subarticular tubercle on Toe I..... ***P. nilotica***

Phylogenetic analyses

Comparison of the mitochondrial 16S rRNA gene sequences corroborated the status of *Ptychadena chrysogaster* as a distinct species. The partial sequence of this species differed from all available comparative sequences by an uncorrected p distance of at least 4.2 %. The p distance to sequences from Rwandan specimens of *P. anchietae* and *P. nilotica* was 13.1–13.3 % and 13.6 %, respectively. The lowest values were observed

Table 1. Distinguishing qualitative characters of *Ptychadena* species from Rwanda.

Species	<i>P. anchietae</i>	<i>P. chrysogaster</i>	<i>P. nilotica</i>	<i>P. porosissima</i>	<i>P. uzunguensis</i>
relative length of Toes III and V	tips reaching to knee or slightly beyond, distal subarticular tubercle never reaching knee	tips reaching beyond knee, distal subarticular tubercle reaching knee	tips reaching beyond knee, distal subarticular tubercle reaching knee or beyond superior, above dorsal edge of arm	tips reaching to knee or slightly beyond, distal subarticular tubercle never reaching knee	tips reaching to knee or slightly beyond, distal subarticular tubercle never reaching knee
position of vocal sac aperture	inferior, at ventral edge of arm insertion	inferior, at ventral edge of arm insertion	superior, above dorsal edge of arm insertion	inferior, at ventral edge of arm insertion	semi-inferior, at level of centre of arm insertion
spiny tubercles on venter	absent	present in males, very small	absent	present in males, comparatively large	present in males, very small
median dorsal ridge on snout	absent	absent	absent	absent	present
outer metatarsal tubercle	very faintly visible	very faintly visible, rarely distinct	distinctly present, rarely faintly visible	faintly visible, rarely distinct	faintly visible
inner metatarsal tubercle size (Fig. 5)	about half the length of metatarsus of Toe I	less than half the length of metatarsus of Toe I	less than half the length of metatarsus of Toe I	more than half the length of metatarsus of Toe I	about half the length of metatarsus of Toe I
supernumerary metacarpal tubercles (Fig. 5)	one below each finger	one below each finger	only one below Finger IV, often indistinct	one below Fingers I, II, and IV; two, rarely one below Finger III	one below Fingers I and IV, two below Finger II, two to four below Finger III
palmar and thenar tubercles (Fig. 5)	inner and outer palmar tubercle more or less equal in length; thenar tubercle oval, slightly longer than palmar tubercles	outer palmar tubercle longer than inner; thenar tubercle elongate, about as long as outer palmar tubercle	outer palmar tubercle longer than inner; thenar tubercle elongate, about as long as outer palmar tubercle	outer palmar tubercle longer than inner; thenar tubercle elongate, longer than outer palmar tubercle	inner and outer palmar tubercle more or less equal in length; thenar tubercle elongate, longer than palmar tubercles
toe webbing (Fig. 5)	I0.5-2II0.5-2III(0.5-1)-2IV2-0.5V	I2-2.5II(1.5-1.75)-3III(2-2-)(3.25-3+IV3-(1.5-2)V	I(1.5-1.75)-(2-2.25)II1.5-(2.75-3)III(1.75-2)-3IV2.75-(1-1.5)V	I(1.75-2)-2.25III1.5-3III1.75-(3-3.25)IV3-(1-1.5)V	I2-(2.25-2.5)III1.5-3III(1.75-2)-3IV3-(1+1.25)V
ventral colouration	head white, trunk yellow	head and trunk yellow	head white, mottled with grey; trunk yellow	head and trunk yellow	colours in life unreported
dark brown stripe on preaxial side of tibia	absent	present, continuous or almost continuous	absent in most specimens; few specimens with dark mottling, not forming continuous stripe	absent	absent

Species	<i>P. anchietae</i>	<i>P. chrysogaster</i>	<i>P. nilotica</i>	<i>P. porosissima</i>	<i>P. uzunguensis</i>
light tibial line (Figs. 1 & 2)	absent	usually present, rarely absent	present or absent	present	absent
light dorsal band	absent	usually present, rarely absent	present or absent	present or absent	present
dark spots on dorsum (Figs. 1 & 2)	usually absent; if present, small and narrow	usually present, small and narrow, sometimes forming longitudinal lines; rarely absent	present; large and wide, sometimes fused with neighboring ones	present; large and wide, sometimes fused with neighboring ones	present, large and wide, often fused with neighboring ones
light, prominent dorsolateral fold (Figs. 1 & 2)	usually absent	present	present	present	present
Colour pattern on postaxial side of femur	irregularly delimited, reticulated, longitudinal bands, alternately yellow and dark brown coloured	irregularly delimited, reticulated, longitudinal dark bands on light background; colours in life unreported	relatively sharply delimited longitudinal bands, alternately yellow and black coloured	yellow spots diffusely arranged in longitudinal rows on dark brown background	irregularly delimited, reticulated, longitudinal light bands on dark background; colours in life unreported

Table 2. Morphometric features of *Ptychadena* species from Rwanda. Data are given as arithmetic means and minimum and maximum values (in mm).

Morphometric character	<i>P. anchietae</i>		<i>P. chrysogaster</i>		<i>P. nilotica</i>		<i>P. porosissima</i>		<i>P. uzunguensis</i>	
	Males N = 15	Females N = 3	Males N = 75/14*	Females N = 23/11*	Males N = 13	Females N = 10	Males N = 11/20*	Females N = 9	Males N = 6	Females N = 1
Snout-vent length	40.4 (38.0-42.4)	49.0 (46.7-51.3)	43.3 (36.3-49.5)	53.7 (48.0-57.7)	42.0 (37.2-45.2)	49.1 (45.6-53.1)	41.2* (37.3-44.5)	46.4 (39.0-52.1)	34.7 (33.3-35.7)	43.3 -
Hindlimb length	79.6 (74.2-84.9)	98.9 (96.0-101.2)	88.1 (83.5-93.0)	108.2 (102.3-114.1)	77.2 (70.1-85.2)	89.6 (78.0-103.9)	78.2* (72.8-85.5)	88.3 (74.3-94.1)	66.7 (61.9-72.7)	81.2 -
Femur length	23.0 (21.9-24.5)	29.0 (28.3-29.6)	23.9 (22.5-25.0)	29.9 (28.1-32.0)	21.5 (19.4-24.0)	25.5 (23.0-28.5)	21.7* (20.2-24.1)	24.4 (19.8-27.6)	18.7 (17.2-19.6)	23.1 -
Tibiofibula length	26.3 (24.4-28.0)	33.1 (31.9-33.8)	28.4 (24.6-32.0)	35.2 (32.4-38.5)	23.4 (21.1-26.1)	27.5 (23.6-32.1)	24.7* (23.3-26.5)	28.7 (25.2-31.0)	21.7 (20.3-23.4)	26.9 -
Tarsus length	34.5 (31.6-36.5)	42.7 (40.6-44.1)	40.9* (38.9-44.1)	49.3* (46.5-51.3)	36.2 (32.4-40.1)	42.8 (35.9-49.6)	35.5 (33.3-38.8)	40.0 (32.6-43.5)	30.5 (27.9-32.2)	36.0 -
Foot length	24.7 (22.4-26.1)	30.5 (29.1-31.3)	28.4 (24.2-30.4)	34.5 (32.9-36.1)	25.7 (22.8-28.2)	29.3 (25.6-33.9)	24.4 (23.0-26.7)	27.4 (23.1-29.3)	21.0 (19.5-21.9)	28.6 -
Forelimb length	16.9 (15.9-18.1)	21.0 (20.0-21.7)	18.3* (17.4-19.1)	22.0* (20.9-23.9)	17.7 (16.0-19.3)	20.5 (17.9-23.7)	17.2 (16.0-18.6)	18.7 (16.1-20.9)	13.5 (12.8-14.4)	16.3 -
Hand length	10.0 (9.5-10.7)	12.3 (12.1-12.6)	10.4* (9.6-11.1)	12.4* (11.8-13.3)	10.4 (9.5-11.6)	11.9 (10.6-13.8)	9.7 (8.9-10.8)	10.7 (9.1-11.7)	7.9 (7.4-8.5)	9.0 -
Head width	13.8 (12.5-15.4)	16.7 (16.4-17.0)	13.9 (12.8-14.7)	16.9 (15.4-17.5)	13.8 (12.4-15.9)	16.4 (14.2-18.8)	14.1 (13.1-15.0)	15.1 (12.5-17.1)	11.4 (11.0-11.7)	13.8 -
Head length	15.5 (14.1-17.6)	18.7 (18.2-19.1)	15.6* (14.7-16.4)	18.6* (17.9-19.8)	16.2 (14.7-18.4)	18.3 (16.6-20.4)	15.5 (14.2-17.8)	17.1 (13.6-19.1)	13.3 (12.3-14.0)	16.1 -
Interorbital distance	2.8 (2.4-3.1)	3.1 (3.0-3.2)	3.5* (3.1-3.9)	4.1* (3.8-4.5)	2.2 (1.9-2.5)	2.5 (2.2-2.7)	2.6 (2.3-2.7)	3.1 (2.8-3.6)	2.7 (2.4-3.1)	2.9 -
Eye lid width	2.8 (2.5-3.1)	3.2 (3.0-3.3)	2.7* (2.4-3.0)	3.3* (2.9-3.7)	2.7 (2.3-3.2)	3.0 (2.4-3.5)	2.8 (2.3-3.1)	3.1 (2.6-3.5)	2.6 (2.3-2.8)	2.4 -

Morphometric character	<i>P. anchietae</i>		<i>P. chrysogaster</i>		<i>P. nilotica</i>		<i>P. porosissima</i>		<i>P. uzunguensis</i>	
	Males	Females	Males	Females	Males	Females	Males	Females	Males	Females
Eye diameter	N = 15 4.3 (3.6–4.9)	N = 3 5.2 (5.0–5.5)	N = 75/14* 4.3 (3.7–4.9)	N = 23/11* 5.0 (4.6–5.6)	N = 13 4.5 (4.1–5.1)	N = 10 5.1 (4.8–5.5)	N = 11/20* 4.2 (3.9–4.5)	N = 9 4.6 (3.9–5.1)	N = 6 3.9 (3.6–4.1)	N = 1 4.5 -
Tympanum diameter	3.3 (2.9–3.6)	4.1 (3.7–4.6)	3.7 (3.2–4.2)	4.5 (4.3–5.1)	3.7 (3.3–4.1)	4.1 (3.7–4.7)	3.1 (2.9–3.49)	3.6 (3.3–3.9)	2.9 (2.5–3.3)	3.5 -
Eye–nostril distance	4.1 (3.7–4.3)	5.2 (4.9–5.7)	3.9* (3.5–4.4)	4.6* (4.0–5.0)	3.6 (3.4–4.0)	4.2 (3.7–4.9)	3.5 (3.1–3.9)	4.2 (3.6–4.7)	3.5 (3.2–3.6)	4.2 -
Snout–nostril distance	3.5 (2.9–4.0)	4.4 (4.3–4.5)	3.9* (3.5–4.3)	4.3* (3.9–4.9)	3.4 (2.9–3.8)	3.7 (3.3–4.1)	3.4 (2.9–3.7)	4.1 (2.8–4.7)	3.6 (3.2–3.9)	4.3 -
Internarial distance	3.9 (3.5–4.3)	4.8 (4.7–4.9)	4.3* (4.0–4.5)	4.9* (4.5–5.2)	3.4 (3.0–3.6)	3.7 (2.0–4.5)	3.6 (3.4–4.0)	4.3 (3.7–4.7)	3.0 (2.9–3.2)	3.7 -
Snout length	7.5 (6.6–8.1)	9.5 (9.0–10.1)	7.4* (7.0–7.9)	8.7* (8.4–9.4)	7.0 (6.3–7.7)	7.9 (7.1–9.3)	7.0 (6.3–7.8)	8.1 (6.2–10.1)	6.7 (6.4–7.0)	8.0 -

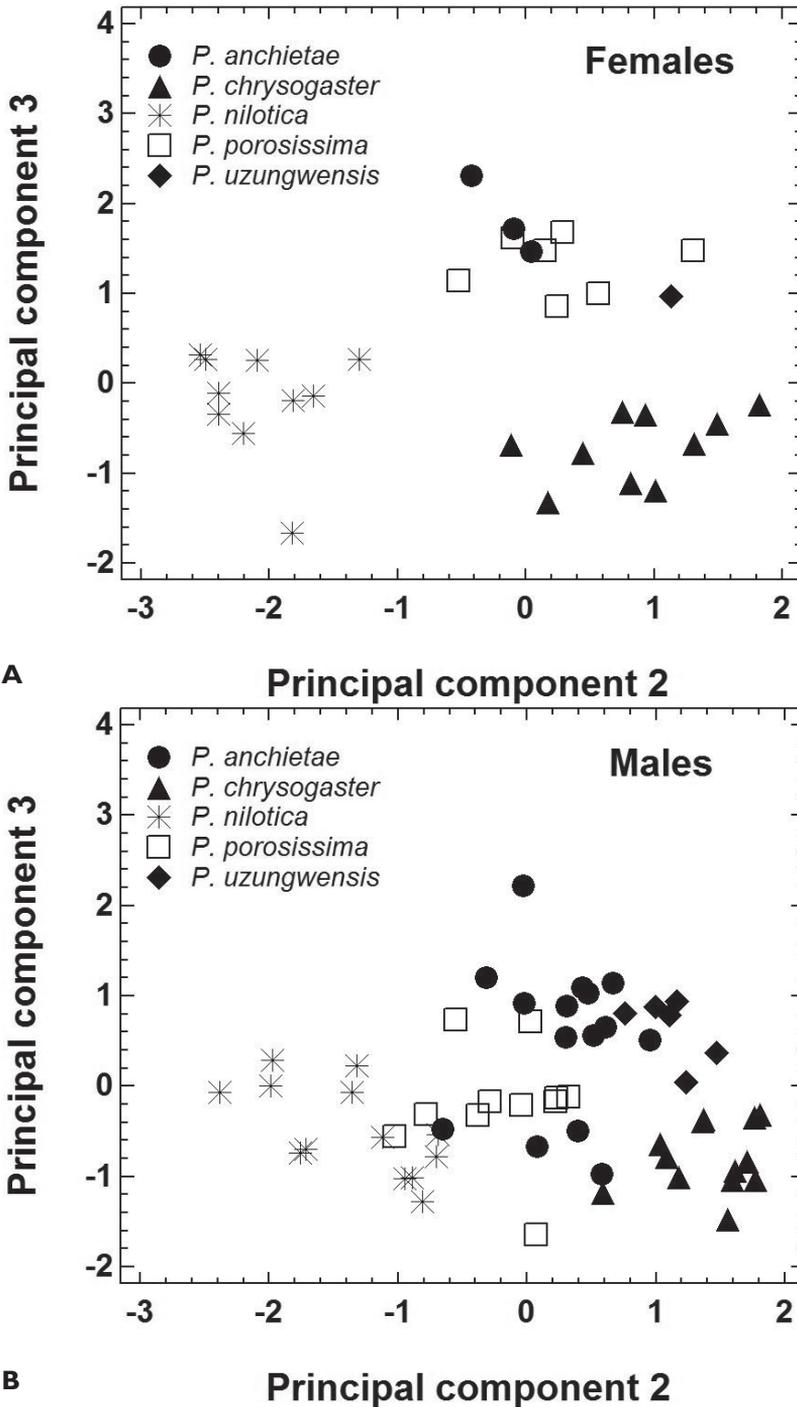


Figure 3. Morphological shape differentiation among 89 specimens representing five *Ptychadena* species, as assessed by principal component analysis (Table 3). **A** Individual scores obtained for 31 females **B** Individual scores obtained for 58 males.

Table 3. Principal component Analysis based on 18 standardized morphometric features of 89 specimens belonging to five *Ptychadena* species from Rwanda. Morphometric parameters accounting strongly for discrimination among species are highlighted in **bold**.

A: Statistical significance			
Principal component	Eigen-value	Relative percentage	Cumulative percentage
1	13.84	76.9	76.9
2	1.46	8.1	85.0
3	0.82	4.6	89.6
B: Standardized coefficients of the principal components			
Parameter	Principal component 1	Principal component 2	Principal component 3
Snout-vent length	0.256	-0.107	-0.084
tibiofibula length	0.253	0.212	-0.011
foot length	0.255	0.046	-0.278
tarsus + foot length	0.257	0.056	-0.246
total hindlimb length	0.261	0.109	-0.137
thigh length	0.260	0.048	-0.033
forearm + hand length	0.253	-0.164	-0.210
hand length	0.244	-0.231	-0.139
head width	0.243	-0.224	-0.016
head length	0.232	-0.319	0.105
interorbital distance	0.171	0.578	-0.237
upper eyelid width	0.201	-0.142	0.272
horizontal eye diameter	0.211	-0.325	0.162
horizontal tympanum diameter	0.231	-0.112	-0.284
eye to nostril distance	0.228	0.016	0.353
nostril to snout distance	0.195	0.326	0.412
snout length	0.234	0.070	0.469
internarial distance	0.227	0.324	0.072

Table 4A. Gender-specific discriminant functions based on 17 SVL-adjusted morphometric features (residuals) to distinguish among five *Ptychadena* species from Rwanda. Statistical significance:

Discriminant function	Eigen-value	Relative percentage	Canonical correlation	Wilks Lambda	Chi-squared	Degrees of freedom	Statistical significance
Male 1	19.79	58.76	0.975	0.0003	362.2	68	P < 0.0001
Male 2	8.49	25.23	0.945	0.0079	222.6	48	P < 0.0001
Male 3	3.29	9.77	0.875	0.0750	119.0	30	P < 0.0001
Male 4	2.10	6.24	0.823	0.3223	52.0	14	P < 0.0001
Female 1	45.49	65.38	0.989	0.00005	187.7	68	P < 0.0001
Female 2	14.84	21.33	0.967	0.0023	114.7	48	P < 0.0001
Female 3	6.87	9.89	0.934	0.0377	62.2	30	P < 0.0001
Female 4	2.36	3.40	0.838	0.2973	23.0	14	P = 0.0596

Table 4B. Gender-specific discriminant functions based on 17 SVL-adjusted morphometric features (residuals) to distinguish among five *Ptychadena* species from Rwanda. Morphometric parameters accounting strongly to discrimination among species are highlighted in **bold**. Standardized coefficients of the discriminant functions:

parameter (residuals)	discriminant function 1 (males)	discriminant function 2 (males)	discriminant function 3 (males)	discriminant function 4 (males)	discriminant function 1 (females)	discriminant function 2 (females)	discriminant function 3 (females)	discriminant function 4 (females)
tibiofibula length	0.909	-0.221	0.302	0.871	0.824	-0.143	0.196	0.384
foot length	0.268	-0.253	0.292	-1.332	2.079	-3.834	-2.308	-0.942
tarsus + foot length	-0.798	2.031	-0.026	1.308	-3.311	4.158	1.119	-0.410
total hindlimb length	0.310	-0.029	-0.147	-0.929	-0.617	0.188	0.361	0.999
thigh length	0.161	-1.001	0.367	-0.108	0.750	0.009	-0.268	0.196
forearm + hand length	-0.172	0.142	-1.406	-0.005	0.468	-0.492	0.483	0.105
hand length	-0.669	-0.506	0.383	-0.189	-0.879	-0.007	0.088	0.328
head width	0.009	-0.137	-0.370	0.326	-0.778	0.997	0.472	0.534
head length	-0.282	-0.341	0.252	-0.389	-0.293	-1.250	-0.563	-0.734
interorbital distance	0.366	0.144	0.285	0.136	1.030	0.561	-0.269	-0.019
upper eyelid width	-0.022	0.315	-0.221	0.328	1.579	0.473	0.810	-0.234
horizontal eye diameter	-0.296	-0.048	0.420	-0.193	1.013	0.232	0.808	0.089
eye to nostril distance	0.417	-0.532	0.473	-0.287	1.016	-0.555	0.242	-0.166
nostril to snout distance	0.072	0.529	0.225	0.124	1.162	-0.599	0.727	-0.818
snout length	-0.291	-0.063	-0.123	0.422	-0.176	0.035	-0.337	0.767
internarial distance	0.666	0.135	-0.861	-0.567	0.594	0.087	-0.026	-0.213
horizontal tympanum diameter	-0.052	-0.157	0.707	-0.187	-1.365	0.088	-0.621	0.488
Constant	0.909	-0.222	0.302	0.871	0.824	-0.143	0.196	0.384

Table 4C. Gender-specific discriminant functions based on 17 SVL-adjusted morphometric features (residuals) to distinguish among five *Ptychadena* species from Rwanda. Classification success.

predicted species actual species	<i>P. anchietae</i>	<i>P. chrysogaster</i>	<i>P. nilotica</i>	<i>P. porosissima</i>	<i>P. uzungwensis</i>
<i>P. anchietae</i> . male	15 (100%)	0	0	0	0
female	3 (100%)				
<i>P. chrysogaster</i> . male	0	13 (100%)	0	0	0
female		10 (100%)			
<i>P. nilotica</i> . male	0	0	13 (100%)	0	0
female			10 (100%)		
<i>P. porosissima</i> . male	0	0	0	11 (100%)	0
female				7 (100%)	
<i>P. uzungwensis</i> . male	0	0	0	0	6 (100%)
female					1 (100%)

in comparison with specimens assigned to “*P. aff. uzungwensis*” (4.2 %), “*P. porosissima*” from South Africa and Rwanda (4.7–4.9 %), “*P. aff. porosissima*” from Tanzania (6.0–6.9 %), “*P. mahmertii*” (6.2 %), and “*P. aff. bibroni*” from Gabon (6.9 %). The consensus tree yielded by Maximum-Likelihood analysis indicated that *P. chrysogaster* is most closely related to the aforementioned species (Figure 6). The clade consisting of these species is well supported by bootstrapping (value 0.90; Hillis and Bull 1993), whereas the relationships within the clade are not resolved (bootstrap values <50 %).

Discussion

Among the examined material we identified five distinct species of *Ptychadena*: *P. anchietae*, *P. chrysogaster*, *P. nilotica*, *P. porosissima*, and *P. uzungwensis*. The five species are distinguishable from each other unambiguously using quantitative morphometric as well as qualitative morphological characters. The comparison of the partial 16S rRNA sequence of a specimen of *P. chrysogaster* with sequences from congeners corroborated its distinct specific status. Sequences from specimens of *P. anchietae*, *P. nilotica*, and *P. porosissima* from Rwanda differ from each other considerably by an uncorrected p distance of more than 10 % (Sinsch et al. 2012, Dehling and Sinsch in press). Unfortunately, no homologous sequence of *P. uzungwensis* from Rwanda and only a sequence of a specimen with doubtful identity from Tanzania (*P. aff. uzungwensis*, GenBank# DQ525945) were available for comparison.

We did not find any *Ptychadena* individual collected in Rwanda which was assignable to *P. oxyrhynchus* in the collections of the RMCA and the ZFMK. Three specimens from Kisenyi (= Gisenyi, nowadays Rubavu; RMCA 51565–67), Rwanda, had been deposited under the name *P. oxyrhynchus* but were re-identified as males of *P. anchietae*. Nieden (1913) reported on several specimens of *P. oxyrhynchus* (as *Rana oxyrhyncha*) which Schubotz had collected in what today is northwestern Tanzania,

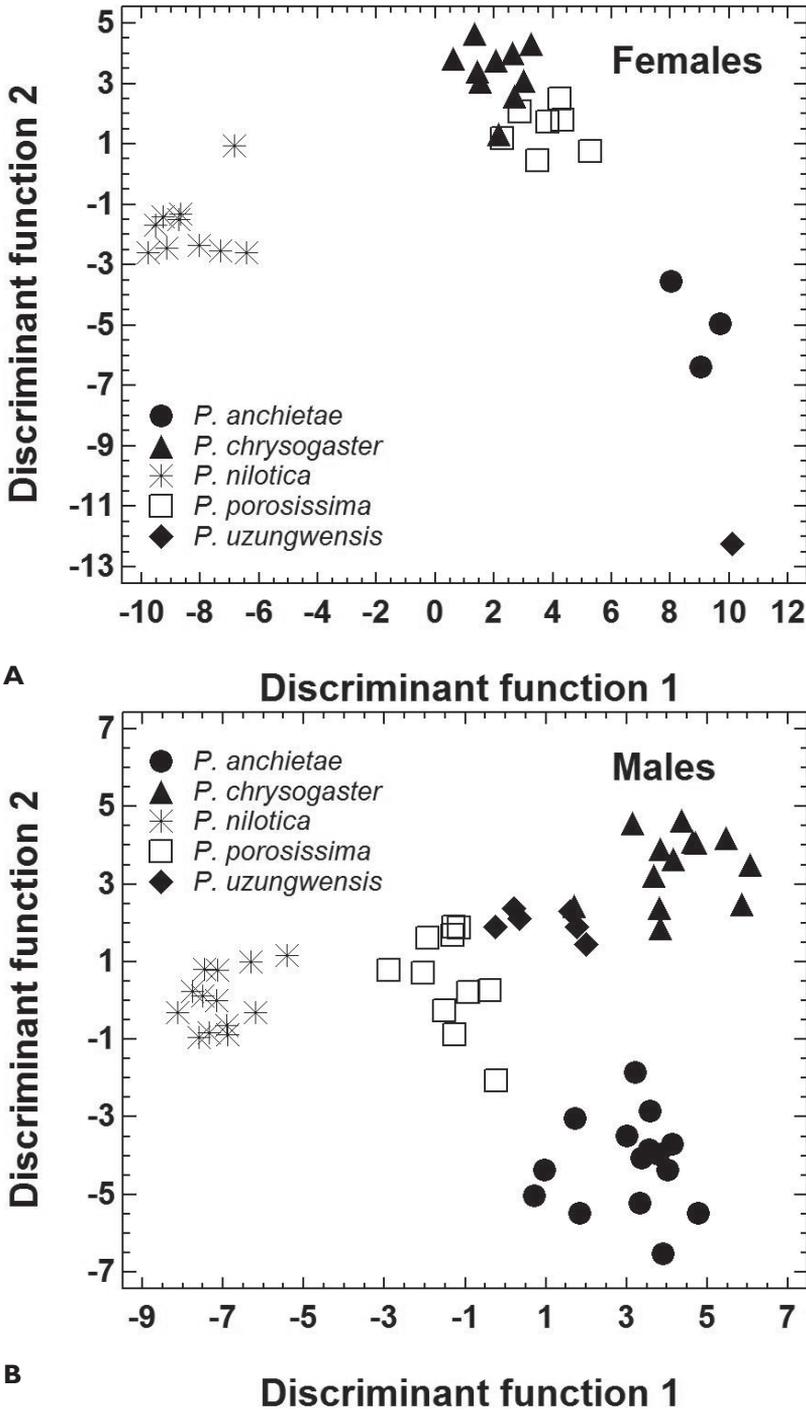


Figure 4. Morphological shape differentiation among 89 specimens representing five *Ptychadena* species, as assessed by discriminant analyses (Statistical details are given in Table 4). **A** Individual scores obtained for 31 females **B** Individual scores obtained for 58 males.

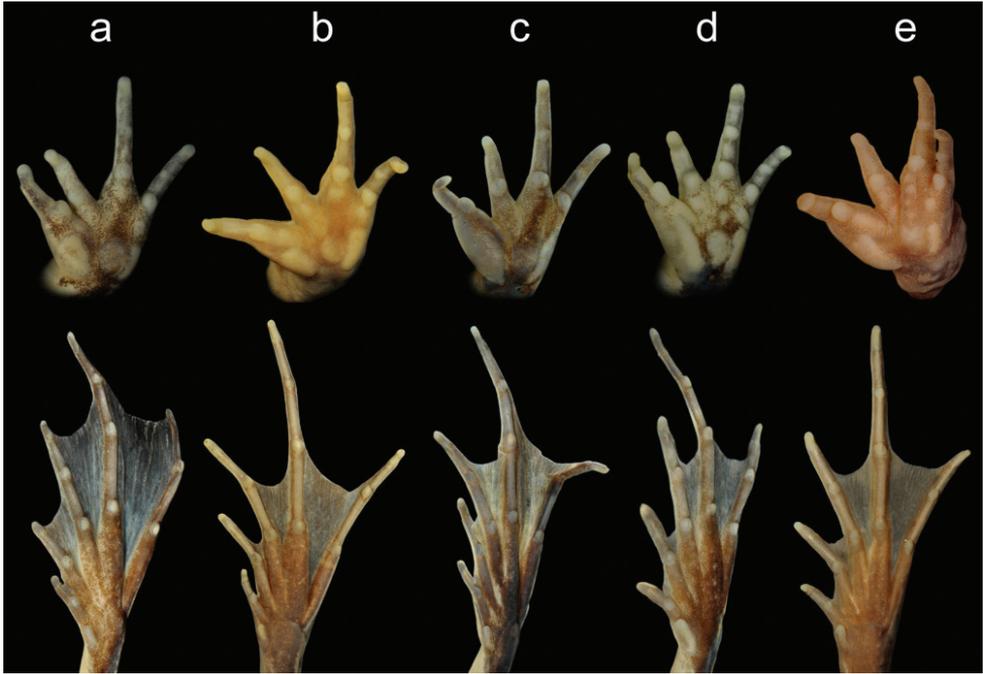


Figure 5. Volar view of hands (top) and plantar view of feet (bottom) of males of *Ptychadena anchietae* (a), *P. chrysogaster* (b), *P. nilotica* (c), *P. porosissima* (d), and *P. uzungwensis* from Rwanda. See also Table 1.

at Kifumbiro and in the Mpororo area, close to the present border with Rwanda. We have not examined Schubotz' material but if his specimens are indeed *P. oxyrhynchus* it is possible that the species can be found in Rwanda as well, given its vast distribution in eastern Africa and the fact that the herpetofauna of the northeastern part of Rwanda has been poorly sampled so far.

There is no specimen of *P. grandisonae* among the material Laurent collected in Rwanda. Laurent (1954) described the species based on type specimens from Muita in Angola, from Kanzenze and Kansenia in Katanga (DRC), and from Bitare in "Urundi" [= Burundi]. The latter is a town in central Burundi, about 20 km north of Gitega at 3°15'S, 29°54'E. Several authors, however, have stated that *P. grandisonae* occurs in Rwanda (Poynton and Broadley 1985, Channing 2001, Poynton and Channing 2004), and Poynton and Channing (2004) even stated that there is no record from Burundi. This misinformation was very likely caused by Laurent himself in a paper which was cited by all above mentioned authors, an account on the "Reptiles et Amphibiens de l'Angola" (Laurent 1964). Therein, Laurent (1964: 139) cited one of the type localities of *P. grandisonae* wrongly as "Bitare (Ruanda)". On the same page, the locality is correctly given as "Bitare [...] (Urundi)" in the account on *Ptychadena uzungwensis*. Thus, the often cited record of *P. grandisonae* from Rwanda in fact refers to specimens from Burundi (RMCA 109036–37; Appendix 1). So far, there is no evidence for the occurrence of *P. grandisonae* in Rwanda.

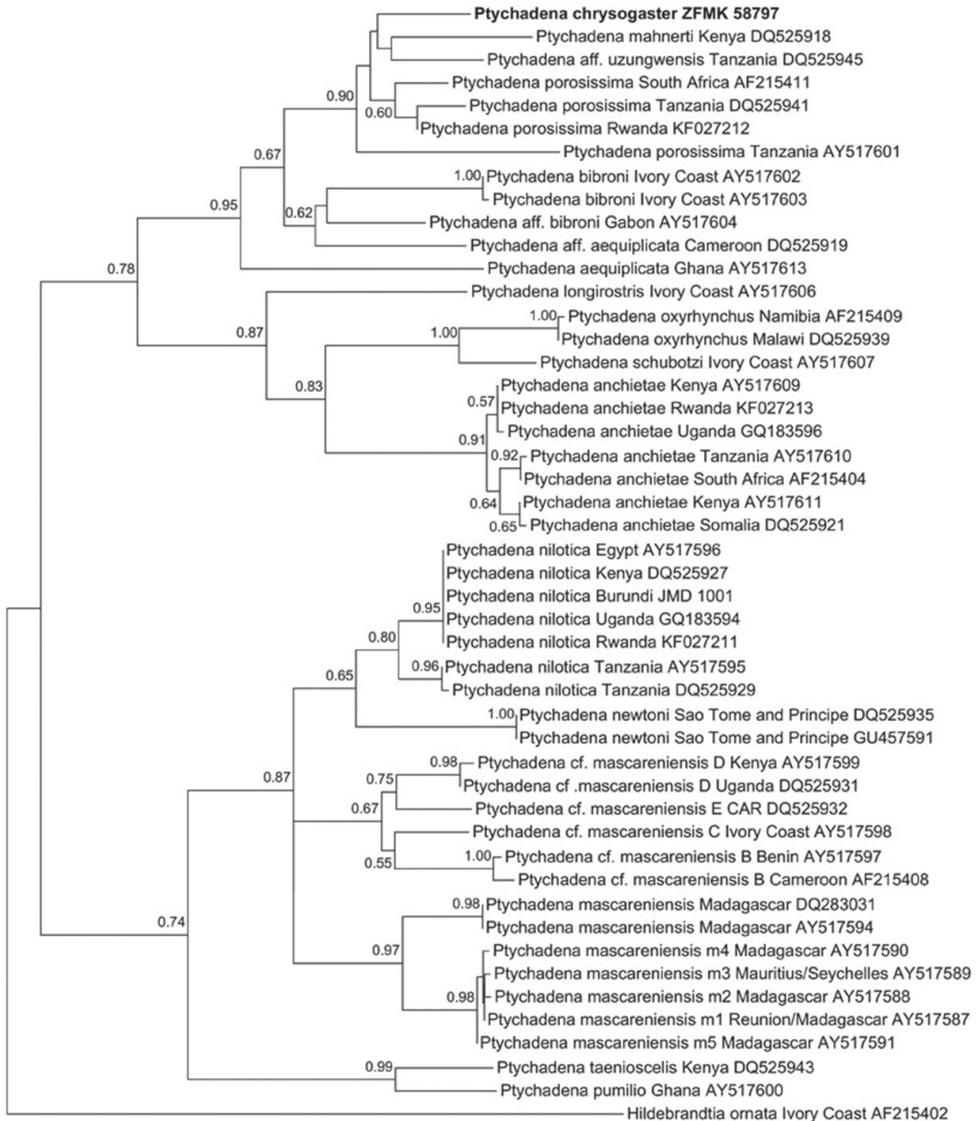


Figure 6. Maximum likelihood phylogram of species in the genus *Ptychadena* and *Hildebrandtia ornata* as outgroup, based on comparison of 548 base pairs of the mitochondrial 16S rRNA gene. Included are specimens from Rwanda and samples taken from GenBank (see Dehling and Sinsch in press for a complete list of sequences and accession numbers). Numbers above nodes are bootstrap support values (only values >0.50 are shown).

The available evidence indicates that only five species of *Ptychadena* occur in Rwanda. At present, three of these species (*P. anchietae*, *P. nilotica*, and *P. porosissima*) are widespread and can be found abundantly in both wetlands of the eastern lowland between 1300 and 2000 m elevation which drains into the Nile River and the western

lowland on the shore of Lake Kivu which drains into the Congo River. The species inhabit higher elevations of up to 2300 m in deforested, cultivated areas, but are absent from dense forest habitats at similar elevations which at present only remain in the Volcano and Nyungwe National Parks and in the Gishwati Forest. *P. uzungwensis* is known from Rwanda from only few specimens, five males from “Kumunini” [= Munini, South Province, 2°42'S, 29°32'E] and a female from “Astrida” [= Butare/Huye, South Province, 2°36'S, 29°44'E], collected in 1952 and 1951, respectively, and has not been found since. Assuming the species is still extant in Rwanda, its distribution is apparently restricted to the south of the country.

There are large series of *P. chrysogaster* from various localities in Rwanda in the collection of the RMCA (Appendix 1), collected by Laurent in 1951–1952, indicating that the species was abundant at that time. We repeatedly conducted surveys at several of these localities including the type locality at Lac Karago (1°37'S, 29°30'E) but did not encounter individuals of *P. chrysogaster*. Our survey periods (February to April, September to October) were at similar times of the year to those of Laurent (January, February, and October). Species of *Ptychadena* are among the most conspicuous frogs in areas they inhabit, usually occurring in high numbers and easy to detect. Although the absence of a species from a certain area cannot be proven ultimately, our observations indicate that *P. chrysogaster* has disappeared from these areas or at least is much less common than it used to be. The human population in Rwanda has grown from little more than 2 million people in 1950 to approximately 11 million in 2011 (United Nations, Population Division 2011). Nowadays almost every cultivatable area except the three national parks and few small forest patches has been altered to farmland (pers. observation). Gishwati Forest has been reduced to a small patch of a few square kilometres, but until the mid-1990s it had covered a large area in northwestern Rwanda and its extensions reached the shores of Lac Karago. The former presence of forest habitat at the lake is still indicated by the occurrence of two forest-dwelling frog species, *Hyperolius castaneus* and *Leptopelis kivuensis*, which call from bushes and groups of small trees at the shore of the river (own unpublished data; see also Sinsch et al. 2011). Judging from its collection sites, *P. chrysogaster* appears to occur primarily in wetlands within or at the edge of forest. Instead of *P. chrysogaster*, we found *P. nilotica* at Lac Karago and *P. nilotica* and *P. anchietae* in Huye (formerly Astrida and Butare) and in the vicinity of Muzanze (formerly Ruhengeri) during our recent surveys, two species that Laurent had not collected in Rwanda. Both species are known to be able to cope with habitat alteration and are often found in disturbed habitats and in human settlements (Spawls et al. 2006, pers. observation). It is possible that habitat alteration promoted population decline in *P. chrysogaster* and its replacement by other species. The distribution of *P. chrysogaster* in Rwanda is currently under study. If our preliminary observations are affirmed, the Red List classification of *P. chrysogaster* would have to be changed to a “threatened” category and it would call for conservation measures.

Our recent efforts to untangle the diversity of *Ptychadena* in Rwanda are a first step to clarify the complicated taxonomy of the genus in sub-Saharan Africa. The results of our studies show that species of *Ptychadena* can be easily distinguished, if standardized

diagnostic schemes are applied, which has also been demonstrated by previous studies (e.g. Perret 1979, Bwong et al. 2009). Integrative approaches combining data from morphology, bioacoustics, and molecular genetics will be the best way to address the existing taxonomic problems. Doubtful delimitations of *Ptychadena* species were often caused by assigning specimens to the wrong species based on non-diagnostic characters. Thereby, states of possible diagnostic characters were mixed up in subsequent accounts on these species, rendering them difficult to distinguish from each other. In the case of *P. chrysogaster*, two of its paratypes were in fact *P. porosissima*, a severe confusion by Laurent (1954). The latter species, however, was described by Laurent in the same paper as yet another new species, *P. loveridgei*. When even the describer cannot reliably distinguish the species, subsequent workers must fail. When reviewing the taxonomic status of certain species, it is mandatory to critically question decisions made by earlier authors by carefully re-evaluating proposed diagnostic characters and re-examining not only the holotypes, but also the material on which accounts discussing the variation within species and keys to species were based.

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Appendix I

Material examined

Ptychadena anchietae: Butare [= Huye], Rwanda (ZFMK 94575–89; twelve males, three females); “Kisenyi (Kivu)” [= Gisenyi/Rubavu, Rwanda] (RMCA 51565–67; three males).

Ptychadena chrysogaster: „Lac Karago, alt. 2250 m, terr. De Kisenyi“, Rwanda (RMCA 109096, one female, holotype; RMCA 109097–109113, sixteen males, paratypes); “Lulenga, Kivu”, DRC (RMCA 3452–69, eleven males, one female, paratypes; 2518–2521, four males, paratypes; 2759–68, one female, nine males, paratypes; 1748–55, seven males, one female, paratypes); “Gatsibu”, Rwanda (RMCA 36844, one male, paratype; 36866, one male, paratype); “Ruhengeri, riv. Moklungwa, alt. 1800–1825 m.), Ruanda” (RMCA 42011–13, three females, paratypes); “Lac Gando, alt. 2400 m, Ruanda” (RMCA 42025–28, four males, paratypes); “Region de Mulera, alt. 1800–2000 m”, Rwanda (RMCA 41987–88, one male, one female, paratypes); “Kasenze (versant S. Karisimbi)”, Rwanda (RMCA 42022–23, two males, paratypes); “entre Managna et Tshengeleru, alt. 1750–2000 m”, DRC (RMCA 41965–41970, four males, one female, paratypes); “Kundhuru-Tshuve (col. Gahinga-Sabinyo), alt. 2600 m”, Rwanda (RMCA 41982–83, one male, one female, paratypes; RMCA 41984–86, three males, paratypes); “Ruhengeri, sources Kirii, alt. 1800–1825 m”, Rwanda (RMCA 41991, female, 41992–93, two males, paratypes); “Riv. Rodahira, afflt. de la riv. Fuku, s/afflt. de la riv. Rutshuru, près de Rutshuru, alt. 1250 m”, DRC (RMCA 116959, one male); “Nyabitsindi, entre le Visoke et le Musule, alt. 2400 m”, Rwanda (RMCA 42016–17, one male, one female, paratypes); “Kibga, riv. Suza, versant Sud Visoke, alt. 2400 m”, Rwanda (RMCA 42018, one male, paratype); “Dubu versant S. Visoke, Ruanda” (RMCA 42019–21, one female, two males, paratypes); “Shamuheru, Nyamuragira, alt. 1843 m”, DRC (RMCA 42031–32, one male, one female, paratypes); “Munagana, marais de Maziba, alt 2000 m”, Uganda (RMCA 41979–80, one male, one juvenile, paratypes); “Ilega (versant S. Karisimbi), Rubinda, alt. 2400 m”, Rwanda (RMCA 42024, subadult, paratype); “Kagogo, Lac Bulera, terr. de Ruhengeri, alt. 1870 m (Ruanda)” (RMCA 109121, one female; 109122, one male, paratypes); “Remera, Lac Luhondo, alt. 1770 m, terr. de Ruhengeri (Ruanda)” (RMCA 109114–120, three males, four females, paratypes); “Mutabonika, près de Nya-bitsindi entre le Visoke et le Musule, alt. 2400 m” (RMCA 42014, one female; 42015, one male; paratypes); “Bitare, alt. 1650 m, Terr. de Kitega, Urundi” [= Burundi] (RMCA 109161–62, two males, paratypes); “Vyuya, Terr. de Bururi, alt. 1900 m (Urundi)” [=Burundi] (RMCA 109163–66, two males, paratypes); “Astrida, alt. 1750 m. (Ruanda)” [=Butare/Huye, Rwanda] (RMCA 109139–141, two females, one male, paratypes); “Tare, Busanza, région d’Astrida, alt. 1700 m (Ruanda)” (RMCA 109142, one female; 109143–147, four males, one female, paratypes); Mugatamba, Pref. Gikongoro, Rwanda (ZFMK 58747, one female);

Nyungwe-Wald, Mukina (Kitabi), Rwanda (ZFMK 58797, one male); Cyamudongo, Rwanda (ZFMK 58847–850); Nyakalengijo, Mt Ruwenzori, Uganda (ZFMK 63239–241).

Ptychadena grandisonae: “Muita-Luembe, E (Angola)” (RMCA 60530, one female, holotype); “Bitare, alt. 1650 m, Terr. de Kitega, Urundi” [= Burundi] (RMCA 109036–37, one male, one female, paratypes).

Ptychadena guibei: “Muita-Luembe, E (Angola)” (RMCA 60535, female, holotype).

Ptychadena nilotica: Butare, Rwanda (ZFMK 94590–612, thirteen males, ten females; JMD 807, one male; EL 15–17, 25–26, 37, one male, five females); Mashyuza, Nyakabuye, Rwanda (ZFMK 58839–846); Route Kigali – Byumba, Rwanda (ZFMK 58851–852); Cyangugu, Rwanda (JMD 961, one male); Lac Karago, Rwanda (JMD 1028–1029); Bugarama, Rwanda (JMD 1074, one male); Bururi, Burundi (JMD 1001–1002, two males); Ruzizi National Park, Burundi (JMD 1015–1016, one male, one female). [JMD & EL specs currently being assigned ZFMK nos.]

Ptychadena porosissima: Butare [= Huye], Rwanda (ZFMK 94613–24, eleven males, one female); “Tare, reg. Astrida”, Rwanda (RMCA 109038, one female, holotype of *Ptychadena loveridgei* Laurent, 1954); “Astrida, alt. 1750 m” [= Huye], Rwanda (RMCA 109085–095, seven males, four females, paratypes of *Ptychadena loveridgei*); “Tare, Busanza”, Rwanda (RMCA 109039, one female, paratype of *Ptychadena loveridgei*); “Karambi, Terr. De Nyanza”, Rwanda (RMCA 109051–056, two females, paratypes of *Ptychadena loveridgei*); “Ruhengeri, riv. Moklungwa, alt. 1800–1825 m., Ruanda” (RMCA 42003–10, eight males, paratypes of *Ptychadena loveridgei*); “Ruhengeri, sources Kirii, alt. 1800–1825 m”, Rwanda (RMCA 41994, paratype of *P. chrysogaster*); “Reg. du Rwankeri, alt. 2200 m, Ruanda” (RMCA 41989, one male, paratype of *P. chrysogaster*).

Ptychadena taenioscelis: “Lukulu près Kiambi”, DRC (RMCA 13122, one subadult female, holotype).

Ptychadena uzungwensis: „Dabaga, Utschungwe Mts.“, Tanzania (RMCA 58843, one male, paratype); “Kumunini, Buyenza, alt. 2000 m, terr. d’ Astrida (Ruanda)” [= Munini, Rwanda] (RMCA 108993–97, five males); “Astrida, marais de la Mukura, alt. 1700 m (Ruanda)” [= Huye, Rwanda] (RMCA 108992, one female); “Bitare, alt. 1650 m, Terr. de Kitega, Urundi” (RMCA 108999–109016).

Appendix 2

Morphological features of *Ptychadena* spp. from Rwanda

The external morphology of each species is described in the following account. Descriptions are primarily based on Rwandan material. In case of *P. chrysogaster* we also included data from type specimens from Burundi, Uganda, and the Democratic Republic of the Congo. The description of *P. uzungwensis* is based on all available material from Rwanda and a male paratype from the type locality (see Appendix 1).

Species accounts

Ptychadena anchietae

Body moderately sturdy, widest at temporal region, slightly tapering to groin; head large (HL/SUL 0.36–0.43 in males, 0.37–0.41 in females; HW/SUL 0.31–0.39 in males, 0.33–0.36 in females), longer than wide (HL/HW 1.01–1.26 in males, 1.11–1.13 in females); snout long (SL/HL 0.43–0.53 in males, 0.49–0.53 in females), pointed in dorsal view, rounded in profile, considerably projecting beyond lower jaw, longer than wide (SL/EE 1.08–1.24 in males, 1.30–1.33 in females); canthus rostralis distinct between eye and nostril, straight-lined; loreal region oblique, strongly concave; nostrils rounded, directed dorsolaterally; situated half-way between tip of snout and eye or closer to tip of snout than to eye (EN/NS 0.98–1.33 in males, 1.14–1.27 in females), separated from each other by distance subequal to distance between eye and nostril (NN/EN 0.87–1.05 in males, 0.85–0.96 in females); eyes directed anterolaterally, moderately protruding, relatively small (ED/HL 0.24–0.29 in males, 0.26–0.29 in females), its diameter much shorter than snout (ED/SL 0.50–0.63 in males, 0.53–0.58 in females); interorbital distance more or less equalling upper eyelid width (IO/EW 0.83–1.10 in males, 0.89–1.06 in females) and smaller than internarial distance (IO/NN 0.59–0.83 in males, 0.63–0.67 in females); tympanum and its annulus distinctly visible, separated from eye by about one-fifth to one-third of its diameter (ET/TD 0.21–0.36 in males, 0.19–0.25 in females); tympanum diameter 0.62–0.92 (in males) and 0.74–0.83 (in females) of eye diameter; upper jaw with dentition; choanae small, rounded, located far anterolaterally at margins of roof of mouth; vomer teeth in two short rows, separated from each other by distance about three times length of individual row; tongue long and narrow, bilobed for about one-sixth of its length, free distally for one-fourths its length; median lingual process absent; vocal sac in males paired, lateral; external vocal sac aperture as a longitudinal, posterolaterally orientated slit, inferior, terminating at level of ventral edge of insertion of arms; internal vocal sac apertures rounded, situated close to corner of mouth.

Dorsal surfaces of head, trunk and limbs finely shagreened with many scattered small tubercles; dorsum with five or six longitudinal dermal ridges on each side; median ridge extending from interorbital region almost to vent, postpalpebral and external ridges from level just behind posterior edge of upper eyelid to insertion of leg; laterodorsal ridge extending from level about one snout length posterior to tympanum to groin; dorsal ridges interrupted in few specimens; sacral ridge extending from about one head length anterior to vent either medially to median ridges or between median and postpalpebral ridges to vent, in few specimens absent; external ridge forming anterior part of supratympanic fold; posterior part of supratympanic fold less distinct, branching off from external dorsal ridge posterior to tympanum in wide angle and extending posterolaterally to insertion of arm; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold; ventral side of limbs and body smooth except

slightly areolate postaxial side of thigh; distinct transverse fold between arms on ventral side; supratympanic fold moderately distinct, angled, extending from posterior corner of eye to point dorsal from arm insertion; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold, continued after a small gap in form of large oval tubercle dorsally of posterior end of arm insertion.

Forelimbs moderately sturdy; hand relatively small (HND/SUL 0.23–0.27 in males, 0.25–0.26 in females); tips of fingers rounded, not enlarged into disks but slightly swollen volarly; transverse dorsal skin ridge separating ultimate from other phalanges on each finger; relative length of fingers: $I \leq II < IV < III$; subarticular tubercles rounded, well developed, numbering one on Fingers I and II, two on Fingers III and IV, proximal tubercles on Fingers III and IV larger and more prominent than distal ones; finger webbing absent; thenar tubercle distinct, large, flat, oval, slightly more than half as long as metacarpal of Finger I; inner palmar tubercle on proximal half of metacarpal region of Fingers II and III, rounded, flat; outer palmar tubercle on proximal half of metacarpal region of Finger IV, oval, slightly more prominent than inner palmar tubercle; one supernumerary metacarpal tubercle between palmar or thenar tubercles and proximal subarticular tubercles on each finger; callous longitudinal ridges between subarticular tubercles on Fingers III and IV and between subarticular tubercles and finger tips on all fingers; nuptial pads in males covering almost entire dorsal surfaces of Fingers I and II, and proximal portion of dorsal side of Finger III.

Hindlimbs sturdy, very long (LEG/SUL 1.87–2.11 in males, 1.96–2.13 in females); knee reaching slightly beyond insertion of forelimbs and tibio-tarsal articulation reaching almost a head length beyond tip of snout when legs are adpressed forwardly to body; tibiofibula very long (TFL/SUL 0.61–0.68 in males, 0.65–0.72 in females), longer than thigh (TFL/THL 1.09–1.19 in males, 1.13–1.16 in females); heels overlapping each other considerably when knees flexed and thighs held perpendicularly to median plane; two low longitudinal ridges on plantar side of tarsus between heel and metatarsal tubercles; foot shorter than or equal in length to tibiofibula (FOT/TFL 0.85–1.00 in males, 0.91–0.93 in females); relative length of toes: $I < II < III < V < IV$; toe tips rounded, not enlarged into disks but slightly swollen plantarly; transverse dorsal skin ridge separating ultimate from other phalanges on each toe; subarticular tubercles numbering one on Toes I and II, two on Toes III and V, and three on Toe IV; low callous ridges between subarticular tubercles, and between subarticular tubercles and toe tips; pedal webbing formula $\text{I}0.5\text{-}2\text{III}0.5\text{-}2\text{III}(0.5\text{-}1)\text{-}2\text{IV}2\text{-}0.5\text{V}$; inner metatarsal tubercle moderately large, half as long as metatarsus of Toe I, oval, prominent; outer metatarsal tubercle rounded, flat, faintly visible, callous tissue weakly developed.

***Ptychadena chrysogaster* Laurent, 1954**

Body moderately sturdy, widest at temporal region, slightly tapering to groin; head large (HL/SUL 0.34–0.38 in males, 0.33–0.37 in females; HW/SUL 0.29–0.34 in

males, 0.28–0.34 in females), longer than wide (HL/HW 1.04–1.22 in males, 1.05–1.23 in females); snout long (SL/HL 0.45–0.50 in males, 0.45–0.51 in females), pointed in dorsal view, rounded in profile, considerably projecting beyond lower jaw, longer than wide (SL/EE 1.11–1.28 in males, 1.11–1.37 in females); canthus rostralis distinct between eye and nostril, straight-lined; loreal region oblique, strongly concave; nostrils rounded, directed dorsolaterally; situated more or less half-way between tip of snout and eye (EN/NS 0.87–1.14 in males, 0.93–1.24 in females), separated from each other by distance subequal to or larger than distance between eye and nostril (NN/EN 1.02–1.22 in males, 0.94–1.24 in females); eyes directed anterolaterally, moderately protruding, relatively small (ED/HL 0.27–0.32 in males, 0.26–0.30 in females), its diameter much shorter than snout (ED/SL 0.57–0.66 in males, 0.51–0.66 in females); interorbital distance larger than upper eyelid width (IO/EW 1.12–1.48 in males, 1.09–1.44 in females) and smaller than internarial distance (IO/NN 0.75–0.89 in males, 0.78–0.91 in females); tympanum and its annulus distinctly visible, separated from eye by about one-fourth to two-fifths of its diameter (ET/TD 0.24–0.38 in males, 0.26–0.40 in females); tympanum diameter slightly smaller to subequal to eye diameter (TD/ED 0.76–0.98 in males, 0.85–1.01 in females); upper jaw with dentition; choanae small, rounded, located far anterolaterally at margins of roof of mouth; vomer teeth in two short rows, separated from each other by distance about three times length of individual row; tongue long and narrow, bilobed for about one-fifth of its length, free distally for one-fourth its length; median lingual process absent; vocal sac in males paired, lateral; external vocal sac aperture as a longitudinal, posterolaterally orientated slit, inferior, terminating at level of ventral edge of ventral insertion of arms; internal vocal sac apertures rounded, situated close to corner of mouth.

Dorsal surfaces of head, trunk and limbs finely shagreened; dorsum with five or six longitudinal dermal ridges on each side, median one extending from interorbital region almost to vent, postpalpebral and external ones from level just behind posterior edge of upper eyelid to insertion of leg; laterodorsal ridge extending from level about one snout length posterior to tympanum to groin; sacral ridge extending from about one head length anterior to vent either medially to median ridges or between median and postpalpebral ridges to vent; in few specimens additional sacromedial ridge extending between sacral ridge and median ridge to vent for about half length of sacral ridge; external ridge forming anterior part of supratympanic fold; posterior part of supratympanic fold less distinct, branching off from external dorsal ridge posterior to tympanum in wide angle and extending posterolaterally to insertion of arm; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold; ventral side of limbs and body smooth except areolate proximal postaxial-ventral part of thigh; distinct transverse fold between arms on ventral side; ventral side of trunk and head densely covered with more or less evenly scattered tiny, pointed tubercles in males.

Forelimbs moderately sturdy; hand relatively small (HND/SUL 0.22–0.26 in males, 0.21–0.25 in females); tips of fingers rounded, not enlarged into disks but slightly swollen volarly; transverse dorsal skin ridge separating ultimate from other

phalanges on each finger; relative length of fingers: I = II < IV < III; subarticular tubercles rounded, well developed, numbering one on Fingers I and II, two on Fingers III and IV, proximal tubercles on Fingers III and IV larger and more prominent than distal ones; finger webbing absent; thenar tubercle prominent, elongated, large, two-thirds length of metacarpal of Finger I; inner palmar tubercle on proximal third of metacarpal region of Fingers II and III, oval, flat; outer palmar tubercle on proximal half of metacarpal region of Finger IV, elongated, slightly more prominent than inner palmar tubercle; one supernumerary metacarpal tubercle between palmar or thenar tubercles and proximal subarticular tubercles on all fingers; low callous longitudinal ridges between subarticular tubercles on Fingers III and IV and between subarticular tubercles and finger tips on all fingers; nuptial pads in males covering almost entire dorsal surfaces of Fingers I and II except distal phalanx, and preaxial half of dorsal side of metacarpal of Finger III.

Hindlimbs sturdy, very long (LEG/SUL 1.94–2.27 in males, 1.93–2.14 in females); knee reaching to insertion of forelimbs and tibio-tarsal articulation reaching slightly more than a snout length beyond tip of snout when legs adressed forwardly to body; tibiofibula very long (TFL/SUL 0.61–0.73 in males, 0.62–0.70 in females), longer than thigh (TFL/THL 1.13–1.22 in males, 1.13–1.25 in females); heels overlapping each other considerably when knees flexed and thighs held perpendicularly to median body plane; two low longitudinal ridges on plantar side of tarsus between heel and metatarsal tubercles; foot subequal in length to tibiofibula (FOT/TFL 0.97–1.07 in males, 0.94–1.03 in females); relative length of toes: I < II < III < V < IV; toe tips rounded, not enlarged into disks but slightly swollen plantarly; transverse dorsal skin ridge separating ultimate from other phalanges on each toe; subarticular tubercles numbering one on Toes I and II, two on Toes III and V, and three on Toe IV; low callous ridges between subarticular tubercles, and between subarticular tubercles and toe tips; pedal webbing formula **I**2-2.5**II**(1.5–1.75)-3**III**(2–2')(3.25–3⁺)**IV**3-(1.5–2)**V**; inner metatarsal tubercle elongated, prominent, small, less than half as long as metatarsus of Toe I; outer metatarsal tubercle very faintly visible, rarely prominent, small and pointed.

Ptychadena nilotica

Body moderately sturdy, widest at temporal region, slightly tapering to groin; head large (HL/SUL 0.35–0.43 in males, 0.35–0.39 in females; HW/SUL 0.30–0.37 in males, 0.32–0.35 in females), longer than wide (HL/HW 1.10–1.27 in males, 1.06–1.15 in females); snout long (SL/HL 0.38–0.46 in males, 0.40–0.45 in females), pointed in dorsal view, rounded in profile, considerably projecting beyond lower jaw, longer than wide (SL/EE 1.20–1.40 in males, 1.15–1.36 in females); canthus rostralis distinct between eye and nostril, straight-lined; loreal region oblique, moderately concave; nostrils rounded, directed dorsolaterally; situated half-way between tip of snout and eye or closer to tip of snout than to eye (EN/NS 0.99–1.18 in males, 1.05–

1.34 in females), separated from each other by distance slightly less than or subequal to distance between eye and nostril (NN/EN 0.82–0.99 in males, 0.87–0.97 in females); eyes directed anterolaterally, moderately protruding, relatively small (ED/HL 0.25–0.32 in males, 0.26–0.29 in females), its diameter shorter than snout (ED/SL 0.60–0.69 in males, 0.59–0.69 in females); interorbital distance smaller to equalling upper eyelid width (IO/EW 0.64–1.03 in males, 0.72–0.90 in females) and smaller than internarial distance (IO/NN 0.55–0.74 in males, 0.57–0.72 in females); tympanum and its annulus distinctly visible, separated from eye by about one-fourth to one-third of its diameter (ET/TD 0.28–0.36 in males, 0.26–0.37 in females); tympanum diameter 0.75–0.88 (in males) and 0.77–0.89 (in females) of eye diameter; upper jaw with dentition; choanae small, rounded, located far anterolaterally at margins of roof of mouth; vomer teeth in two short rows, separated from each other by distance about three times length of individual row; tongue long and narrow, bilobed for about one-sixth of its length, free distally for one-third its length; median lingual process absent; vocal sac in males paired, lateral; external vocal sac aperture as a longitudinal, posteriorly orientated slit, situated dorsally of level of insertion of arms, parallel to mandible and infratympanic fold, covered by narrow dermal flap on ventral edge of slit; internal vocal sac apertures rounded, situated close to corner of mouth.

Dorsal surfaces of head, trunk and limbs shagreened; dorsum with four or five longitudinal dermal ridges on each side, median one extending from interorbital region almost to vent, postpalpebral and external ones from level just behind posterior edge of upper eyelid to insertion of leg; laterodorsal ridge extending from level about one snout length posterior to tympanum to groin; in few specimens additional very short ridge present between median and postpalpebral ridge from about one snout length anterior to vent extending almost to vent; external ridge forming anterior part of supratympanic fold; posterior part of supratympanic fold less distinct, branching off from external dorsal ridge posterior to tympanum in wide angle and extending posterolaterally to insertion of arm; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold; ventral side of limbs and body smooth except areolate postaxial side of thigh; distinct transverse fold between arms on ventral side.

Forelimbs moderately sturdy; hand relatively small (HND/SUL 0.21–0.27 in males, 0.22–0.26 in females); tips of fingers rounded, not enlarged into disks but slightly swollen volarly; transverse dorsal skin ridge separating ultimate from other phalanges on each finger; relative length of fingers: $I \leq II < IV < III$; subarticular tubercles rounded, well developed, numbering one on Fingers I and II, two on Fingers III and IV; proximal tubercles on Fingers III and IV larger and more prominent than distal ones; finger webbing absent; thenar tubercle prominent, elongated and narrow, comparatively small, less than half as long as metacarpal of Finger I; inner palmar tubercle small, flat, less conspicuous, on proximal one-third to one-fourth of metacarpal region of Fingers II and III, rounded, flat; outer palmar tubercle on proximal half of metacarpal region of Finger IV, prominent, elongate and narrow; single supernumerary metacarpal tubercle between outer palmar tubercle and proximal subarticular tu-

bercle of Finger IV, often indistinct; callous longitudinal ridges between subarticular tubercles on Fingers III and IV and between subarticular tubercles and finger tips on all fingers; nuptial pads in males covering almost entire dorsal surfaces of Fingers I and II and preaxial half of dorsal surface of Finger III.

Hindlimbs sturdy, long (LEG/SUL 1.71–1.97 in males, 1.76–1.96 in females); knee reaching just behind insertion of forelimbs and tibio-tarsal articulation reaching tip of snout when legs are addressed forwardly to body; tibiofibula moderately long (TFL/SUL 0.50–0.60 in males, 0.54–0.60 in females), longer than thigh (TFL/THL 1.04–1.12 in males, 1.09–1.12 in females); heels overlapping each other when knees flexed and thighs held perpendicularly to median plane; two low longitudinal ridges on plantar side of tarsus between heel and metatarsal tubercles; foot long, longer than tibiofibula (FOT/TFL 1.07–1.14 in males, 1.03–1.10 in females); relative length of toes: I < II < III < V < IV; toe tips rounded, not enlarged into disks but slightly swollen plantarly; transverse dorsal skin ridge separating ultimate from other phalanges on each toe; subarticular tubercles numbering one on Toes I and II, two on Toes III and V, and three on Toe IV; low callous ridges between subarticular tubercles, and between subarticular tubercles and toe tips; pedal webbing formula **I**(1.5–1.75)-(2–2.25)**III**1.5-(2.75–3)**III**(1.75–2)-3**IV**2.75-(1–1.5)**V**; inner metatarsal tubercle elongated, prominent, small, less than half as long as metatarsus of Toe I; outer metatarsal tubercle rounded, flat, distinctly present, rarely faintly visible.

Ptychadena porosissima

Body moderately sturdy, widest at temporal region, slightly tapering to groin; head large (HL/SUL 0.35–0.41 in males, 0.35–0.40 in females; HW/SUL 0.31–0.36 in males, 0.30–0.34 in females), longer than wide (HL/HW 1.02–1.19 in males, 1.03–1.21 in females); snout moderately long (SL/HL 0.38–0.49 in males, 0.43–0.51 in females), pointed in dorsal view, rounded in profile, considerably projecting beyond lower jaw, longer than wide (SL/EE 1.21–1.27 in males, 1.11–1.61 in females); canthus rostralis distinct between eye and nostril, straight-lined; loreal region oblique, strongly concave; nostrils rounded, directed dorsolaterally; situated more or less halfway between tip of snout and eye (EN/NS 0.89–1.15 in males, 0.87–1.29 in females), separated from each other by distance subequal to or larger than distance between eye and nostril (NN/EN 0.96–1.15 in males, 0.96–1.11 in females); eye directed anterolaterally, moderately protruding, relatively small (ED/HL 0.24–0.30 in males, 0.25–0.29 in females), its diameter much shorter than snout (ED/SL 0.54–0.67 in males, 0.51–0.63 in females); interorbital distance subequal to upper eyelid width (IO/EW 0.80–1.09 in males, 0.81–1.10 in females) and smaller than internarial distance (IO/NN 0.65–0.74 in males, 0.60–0.82 in females); tympanum and its annulus distinctly visible, separated from eye by about one-fourth to two-fifths of its diameter (ET/TD 0.27–0.39 in males, 0.29–0.39 in females); tympanum diameter smaller than eye diameter (TD/ED 0.68–0.81 in males, 0.70–0.84 in females); upper jaw with dentition;

choanae small, rounded, located far anterolaterally at margins of roof of mouth; vomer teeth in two short rows, separated from each other by distance about three times length of individual row; tongue long and narrow, bilobed for about one-fifth of its length, free distally for one-third its length; median lingual process absent; vocal sac in males paired, lateral; external vocal sac aperture as a longitudinal, posterolaterally orientated slit, inferior, terminating at level of ventral edge of insertion of arms; internal vocal sac apertures rounded, situated close to corner of mouth.

Dorsal surfaces of head, trunk and limbs finely shagreened; dorsum with four or five longitudinal dermal ridges on each side; median ridge extending from interorbital region almost to vent, postpalpebral and external ridges from posterior edge of upper eyelid to insertion of leg; laterodorsal ridge extending from level of insertion of arm to groin; sacral ridge extending from about one head length anterior to vent to vent, in some specimens absent; external ridge forming anterior part of supratympanic fold; posterior part of supratympanic fold less distinct, branching off from external dorsal ridge posterior to tympanum in wide angle and extending posterolaterally to insertion of arm; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold; ventral side of limbs and body smooth except areolate postaxial side of thigh; distinct transverse fold between arms on ventral side; ventral side of trunk and head densely covered with more or less evenly scattered small, pointed tubercles in males.

Forelimbs moderately sturdy; hand relatively small (HND/SUL 0.22–0.26 in males, 0.22–0.24 in females); tips of fingers rounded, not enlarged into disks but slightly swollen volarly; transverse dorsal skin ridge separating ultimate from other phalanges on each finger; relative length of fingers: $I \leq II < IV < III$; subarticular tubercles rounded, well developed, numbering one on Fingers I and II, two on Fingers III and IV, proximal tubercles on Fingers III and IV larger and more prominent than distal ones; finger webbing absent; thenar tubercle distinct, elongated, large, two-thirds length of metacarpal of Finger I; inner palmar tubercle on proximal third of metacarpal region of Fingers II and III, oval, flat; outer palmar tubercle on proximal half of metacarpal region of Finger IV, elongated, slightly more prominent than inner palmar tubercle; one supernumerary metacarpal tubercle between palmar or thenar tubercles and proximal subarticular tubercles on Fingers I, II, and IV, two on Finger III; callous longitudinal ridges between subarticular tubercles on Fingers III and IV and between subarticular tubercles and finger tips on all fingers; nuptial pads in males covering almost entire dorsal surfaces of Fingers I and II and preaxial half of dorsal side of Finger III.

Hindlimbs sturdy, very long (LEG/SUL 1.77–2.05 in males, 1.80–2.06 in females); knee reaching to insertion of forelimbs and tibio-tarsal articulation reaching slightly more than one snout length beyond tip of snout when legs adpressed forwardly to body; tibiofibula long (TFL/SUL 0.56–0.65 in males, 0.56–0.66 in females), longer than thigh (TFL/THL 1.08–1.18 in males, 1.05–1.26 in female); heels overlapping each other considerably when knees flexed and thighs held perpendicularly to median plane; two low longitudinal ridges on plantar side of tarsus between heel and meta-

tarsal tubercles; foot slightly shorter than or equal in length to tibiofibula (FOT/TFL 0.94–1.01 in males, 0.92–1.01 in females); relative length of toes: I < II < III < V < IV; toe tips rounded, not enlarged into disks but slightly swollen plantarly; transverse dorsal skin ridge separating ultimate from other phalanges on each toe; subarticular tubercles numbering one on Toes I and II, two on Toes III and V, and three on Toe IV; low callous ridges between subarticular tubercles, and between subarticular tubercles and toe tips; pedal webbing formula **I**(1.75–2)–2.25**II**1.5–3**III**1.75–(3–3.25)**IV**3–(1–1.5)**V**; inner metatarsal tubercle very prominent, shovel-like, large, more than half as long as metatarsus of Toe I; outer metatarsal tubercle faintly visible, rarely prominent and pointed.

Ptychadena uzungwensis

Body moderately sturdy, widest at temporal region, slightly tapering to groin; head large (HL/SUL 0.36–0.39 in males, 0.37 in females; HW/SUL 0.32–0.35 in males, 0.32 in female), longer than wide (HL/HW 1.06–1.23 in males, 1.16 in female); snout long (SL/HL 0.50–0.52 in males, 0.50 in female), pointed in dorsal view, rounded in profile, considerably projecting beyond lower jaw, much longer than wide (SL/EE 1.30–1.53 in males, 1.56 in female); canthus rostralis distinct between eye and nostril, straight-lined; loreal region oblique, strongly concave; nostrils rounded, directed dorsolaterally; situated more or less half-way between tip of snout and eye (EN/NS 0.91–1.03 in males, 0.97 in female), separated from each other by distance subequal to or shorter than distance between eye and nostril (NN/EN 0.82–0.94 in males, 0.89 in female); eyes directed anterolaterally, moderately protruding, relatively small (ED/HL 0.27–0.32 in males, 0.28 in female), its diameter much shorter than snout (ED/SL 0.55–0.63 in males, 0.56 in female); interorbital distance subequal to or larger than upper eyelid width (IO/EW 0.97–1.24 in males, 1.19 in female) and smaller or subequal to internarial distance (IO/NN 0.80–1.06 in males, 0.78 in female); tympanum and its annulus distinctly visible, separated from eye by about two-fifths to half of its diameter (ET/TD 0.36–0.47 in males, 0.41 in female); tympanum diameter smaller than eye diameter (TD/ED 0.70–0.83 in males, 0.77 in female); upper jaw with dentition; choanae small, rounded, located far anterolaterally at margins of roof of mouth; vomer teeth in two short rows, separated from each other by distance about two and half times length of individual row; tongue long and narrow, bilobed for about one-third of its length, free distally for one-third its length; median lingual process absent; vocal sac in males paired, lateral; external vocal sac aperture as a longitudinal, posterolaterally orientated slit, semi-inferior, terminating at level of centre of insertion of arms; internal vocal sac apertures rounded, situated close to corner of mouth.

Dorsal surfaces of head, trunk and limbs finely shagreened; dorsum with four longitudinal dermal ridges on each side; median ridge extending from dorsal side of snout between nostrils almost to vent; postpalpebral ridge extending from posterior portion of upper eyelid, external ridge from level of tympanum to insertion of leg; laterodorsal

ridge extending from level of tympanum to groin; external ridge forming anterior part of supratympanic fold; posterior part of supratympanic fold less distinct, branching off from external dorsal ridge posterior to tympanum in wide angle and extending posterolaterally to insertion of arm; infratympanic fold thick and conspicuous, almost straight-lined, extending from ventral edge of eye to level of arm insertion, meeting with supratympanic fold; ventral side of limbs and body smooth except areolate post-axial side of thigh; distinct transverse fold between arms on ventral side; ventral side of trunk and head densely covered with more or less evenly scattered small, pointed, very small tubercles in males.

Forelimbs moderately sturdy; hand relatively small (HND/SUL 0.22–0.24 in males, 0.21 in female); tips of fingers rounded, not enlarged into disks but slightly swollen volarly; transverse dorsal skin ridge separating ultimate from other phalanges on each finger; relative length of fingers: II = IV \leq I < III; subarticular tubercles rounded, well developed, numbering one on Fingers I and II, two on Fingers III and IV, proximal tubercles on Fingers III and IV larger and more prominent than distal ones; finger webbing absent; thenar tubercle distinct, elongated, large, half as long as metacarpal of Finger I; inner palmar tubercle on proximal third of metacarpal of Finger III, small, roundish, flat; outer palmar tubercle on proximal third of metacarpal of Finger IV, elongated, more prominent than inner palmar tubercle; one supernumerary metacarpal on Fingers I and IV, two on Finger II, and two to four on Finger III between palmar or thenar tubercles and proximal subarticular tubercles; callous longitudinal ridges between subarticular tubercles on Fingers III and IV and between subarticular tubercles and finger tips on all fingers; nuptial pads in males covering almost entire dorsal surfaces of metacarpal and proximal phalanx of Fingers I and II and preaxial halves of dorsal sides of metacarpal and [in Rwandan specimens but not in paratype and specimens from Kivu and Burundi] proximal portion of proximal phalanx of Finger III.

Hindlimbs sturdy, very long (LEG/SUL 1.84–2.04 in males, 1.87 in female); knee reaching to insertion of forelimbs and tibio-tarsal articulation reaching slightly more than one snout length beyond tip of snout when legs adpressed forwardly to body; tibiofibula long (TFL/SUL 0.59–0.66 in males, 0.62 in female), longer than thigh (TFL/THL 1.12–1.20 in males, 1.16 in female); heels overlapping each other considerably when knees flexed and thighs held perpendicularly to median body plane; two low longitudinal ridges on plantar side of tarsus between heel and metatarsal tubercles, postaxial one less distinct than preaxial one; foot shorter than or subequal in length to tibiofibula (FOT/TFL 0.94–1.03 in males, 1.07 in female); relative length of toes: I < II < III < V < IV; toe tips rounded, not enlarged into disks but slightly swollen plantarily; transverse dorsal skin ridge separating ultimate from other phalanges on each toe; subarticular tubercles numbering one on Toes I and II, two on Toes III and V, and three on Toe IV; low callous ridges between subarticular tubercles, and between subarticular tubercles and toe tips; pedal webbing formula **I**2-(2.25–2.5)**II**1.5-3**III**(1.75–2)-3**IV**3-(1+–1.25)**V**; inner metatarsal tubercle prominent, elongated, large, half as long as metatarsus of Toe I; outer metatarsal tubercle faintly visible.